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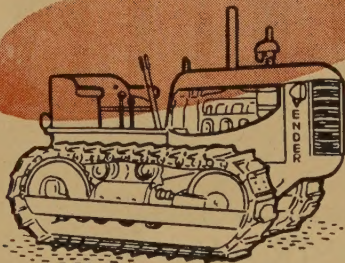
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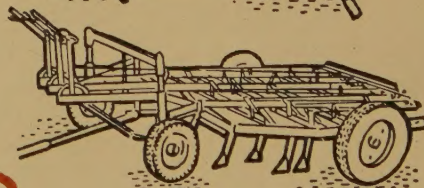
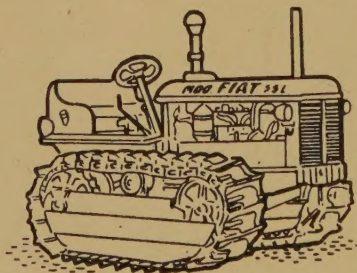
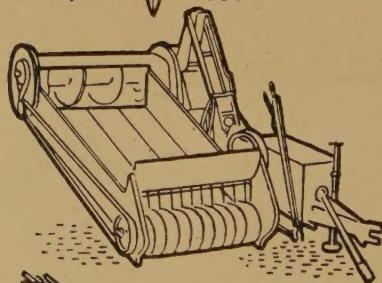
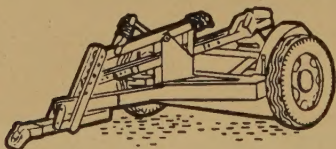
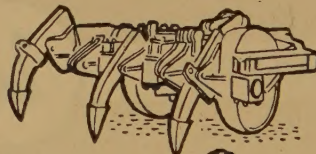
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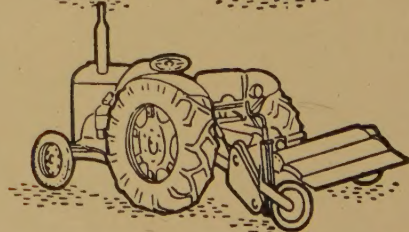
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# AGRICULTURE

WESTERN



AUSTRALIA

ISSUED BY DIRECTION OF THE MINISTER FOR AGRICULTURE

VOL. I (Third Series) NOVEMBER-DECEMBER, 1952

No. 6

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Vigorous passion vines growing on a river flat in the Harvey district.

# THE PASSION FRUIT

## *Its Cultivation in Western Australia*

By F. MELVILLE, B.Sc. Agric., Acting Assistant Superintendent of Horticulture

**P**ASSION fruit has been grown commercially for many years in Western Australia, where its delightful flavour has made it very popular. It may be eaten fresh or as a component of fruit salads and preserves, is held in high regard by housewives for flavouring cakes and icing, and more recently has been extensively used in the production of a proprietary aerated beverage.

It belongs to a large group of climbing plants found growing naturally in tropical and sub-tropical countries but, although many species bear edible fruits, only a small number are cultivated commercially, and these generally on a limited scale. Australia, South Africa, Kenya and New Zealand are among the few countries producing passion fruit in commercial quantities under cultivated conditions.

In Australia, the main areas are situated in New South Wales and Queensland but owing to the prevalence of diseases, particularly brown spot and woodiness, expansion has been restricted. Production in Western Australia has always been small due to the limited demand for the fruit on the local market while the introduction of the brown spot disease has also been a factor. Since the war, however, a demand has

been created for factory fruit and this has caused greater interest in passion fruit growing.

Although the passion vine, under natural conditions, is found in a moist sub-tropical climate, it has adapted itself extremely well to the cool temperate conditions which prevail in the fruit-growing areas of this State. It has proved successful throughout most of the fruit belt, which extends from approximately 50 miles north of Perth southward along the coastal strip and foothills almost to the south coast taking in the apple districts from Donnybrook to Manjimup. Success has also been achieved further east in the vicinity of Albany.

Pre-war passion fruit was grown mainly in the warmer hills districts as far south as Donnybrook. Since the war, however, attention has been directed more towards southern districts particularly the Albany-Denmark and Manjimup-Pemberton areas. This increased interest in passion fruit growing resulted from the establishment of processing facilities in this State and the total area planted is now in the vicinity of 250 acres.

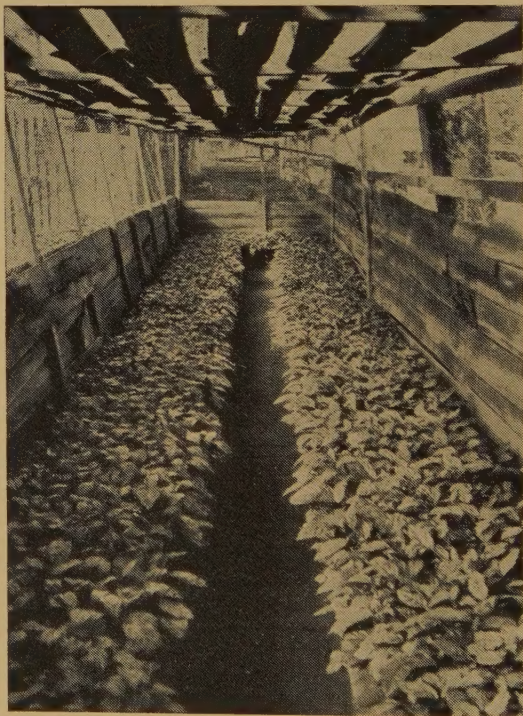
The fruit ripens earlier in the warmer areas, and harvesting of the main summer crop can be commenced in January. In the late southern districts picking starts in March and extends to May. There is, therefore, a fairly wide spread in marketing which helps maintain prices at a satisfactory level.

It is common practice to grow passion fruit as a subsidiary to other forms of fruit-growing and also in conjunction with grazing and under this system it has proved a very profitable sideline. Quicker returns are obtained than with most fruit crops and a payable crop should be produced the second summer after planting. However, the vines are relatively short-lived and, where diseases are prevalent, the productive life may be seriously curtailed unless adequate control measures are taken. Commercial plantings up to 15

years old have been seen but usually six years is a good average life for the vines if properly looked after.

## SELECTION AND PREPARATION OF SITE

For successful growth, the passion vine requires a sunny position sheltered from cold winds and moderately free from frost. Mature vines will withstand a certain amount of frost, and damage from this cause is not common but it is advisable to select a



Seedlings require a sheltered position with partial shade and should be well thinned to produce sturdy plants.

high frost-free position if possible. Young plants in a tender condition may be damaged, and planting should not be commenced until the danger of frosts is over, while some protection may be necessary during the first winter.

Strong summer land winds can cause serious blemish to the fruit through mechanical damage, and shelter in the

form of windbreaks should be provided under such conditions. In cooler districts, very satisfactory results are obtained when the passion vines are planted with the rows running in a north-south direction since both sides of the trellis receive equal shares of sunshine. Nevertheless, due regard must be given to soil conservation, and planting up and down slopes should be avoided. In situations where brown spot is troublesome, planting the rows in the direction of the prevailing winds may allow the foliage to dry out more quickly after rain or heavy dew and help to counter the disease.

Drainage is probably the most important factor to be taken into consideration in selecting a planting site, for although passion vines will grow in a wide variety of soils, good drainage is essential. The soil should preferably



Vines are ready for transplanting when about nine inches high.

be deep and friable and free from a stiff subsoil which could restrict water movement. Some of the best plantings seen have been on deep sandy soils. The vines need adequate supplies of summer moisture and, where irrigation cannot be supplied, the soil must be

sufficiently retentive of moisture to carry the vines through the summer.

Prior to planting, the ground should be thoroughly cleared. Termites can be very destructive to passion vines and it is important to remove stumps and roots which might harbour them, and to deal with any nests found. Except in very light soils, deep cultivation is advisable to thoroughly stir the soil and, if possible, the land should be fallowed the winter before planting.

## VARIETIES

Practically all types of passion fruit grown in Western Australia are varieties of the purple fruited *Passiflora edulis*. The best commercial variety is the medium-sized hard-shelled type which produces heavy crops of high quality fruit. The pulp content is high and the flavour excellent. The Mammoth variety is sometimes grown because of its attractive size and appearance, but although the fruit is large it is often not well filled with pulp while the vines bear lighter crops. The banana passion fruit or *Tacsonia* is grown on a small scale to supply the market when the purple passion fruit is in short supply. Although the *Tacsonia* is a hardier plant, the fruit is inferior, of no use for pulping and cannot successfully compete with the purple varieties.

## PROPAGATION

There are no clonal varieties of passion fruit, and vines for commercial planting are raised from seed. It is possible to propagate the plants from cuttings or by grafting on to a wild vine stock but in practice plants grown from properly selected seed are preferable.

There is considerable variation between seedlings as regards cropping and quality of fruit, and a careful selection of seed is therefore essential if a uniformly good planting is to be obtained. Fruits should be collected from disease-free plants known from past experience to consistently bear

good crops of high quality well-filled fruit. Large fruit is not necessarily a criterion of quality since it is often poorly filled with pulp and may originate from a light crop. On the other hand small fruit is undesirable.

Choose well-matured fruit and, if it is desired to keep the seed for some time, the fruit may be allowed to dry naturally and crushed to release the seed or, alternatively, the pulp may be squeezed from the fruit, carefully dried and stored. It is not advisable to keep the seed for long periods before planting.



A young vine trained on a two-wire vertical trellis. Note the stake used for training the young plant to the wires.

Passion fruit seeds may be sown directly from the fresh fruit or the pulp may be fermented for two or three days and the seed carefully washed and dried first. Where germination is not satisfactory, improvement can be effected by treating the seed prior to planting. Various methods have been used successfully but much depends upon the hardness of the seed coat as to the results obtained. Treatment with hot water either before sowing or in the nursery bed is often used, or the seed may be soaked for several hours in water fol-

lowed by immersion in a solution prepared by adding 20 drops of a saturated chlorine solution to one pint of water. Place the container in bright light and allow the seed to soak for one to two hours. Do not allow the seed to remain in the solution once it shows signs of germinating and wash with water before planting.

Plant the seed either in nursery beds or boxes prepared from a free-working, well-drained soil containing a liberal amount of organic matter. Incorporate well-decayed farmyard manure and a light dressing of a mixed fertiliser in the bottom of the bed and fill up with light clean soil. Sow the seed thinly in drills, not more than half an inch deep and nine inches apart or broadcast over the surface and cover with a light sandy soil. A mulch of organic matter spread over the surface is beneficial for reducing moisture loss. The seed bed must be kept moist but not over-watered and germination should take place in from three to five weeks.

The seed is best planted in March, and seedlings should then be large enough for transplanting in the spring. If desired sowing can be carried out in the spring and early summer, but seed is more difficult to obtain at these times.

As the plants grow it is necessary to thin them out to selected strong plants evenly spaced from four to six inches apart. It is important to avoid overcrowding or the plants will grow weak and spindly and give poor results when planted in the field. If the number of plants required is small the seedlings may be transferred at the four-leaf stage to earthenware pots, tins or other

containers. This will obviate the necessity for thinning but only the stronger plants should be selected. Grown this way the plants receive less shock when transplanted in the field.

The seedlings require partial shade and also shelter from winds for satisfactory growth and these requirements may be met by erecting an overhead lath or brush shelter. Provision should be made for varying the amount of shade according to weather conditions and increasing the amount of sunlight as the plants increase in size. Some shade is advisable until the plants are ready to be hardened off prior to planting out.

### PLANTING

The young vines are ready for transplanting when about nine inches high. If larger, the growth should be shortened back so that undue strain is not placed on the root system after planting out. Springtime is preferred for planting but the ideal time will vary from mid-September to early November according to the climatic conditions. In the warmer northerly areas, planting may be started earlier than in cooler districts. Before lifting is commenced the bed should be thoroughly watered and, as far as possible transplanting should be carried out on a cool, cloudy day.

The distance between plants and between rows will depend upon moisture supplies available during the summer. Where moisture supplies are limited, wider planting is necessary, but under average conditions 10ft. between rows and 16ft. to 18ft. between plants

proves most satisfactory. It is well to take into consideration the width of cultivation equipment in deciding on row width, allowing that the vines will overhang at least a foot each way in the rows.

In many soils, applications of phosphate and potash do not readily penetrate to the root zone, and therefore a good reserve of these elements should be supplied in the bottom of each hole before planting. To ensure this, open up holes along each planting line 12in. in diameter and 12in. deep and thoroughly incorporate one pound of mixed fertiliser such as potato manure with the soil in the bottom of each hole. If available a light dressing of organic manure such as fowl manure may be added.

Fill in the top soil and plant the young vines at the same level as they were growing in the nursery but ensure that the roots do not come into contact with any fertiliser. On no account allow the plants to become dry during the planting operations and thoroughly



Training a vine on a three-wire horizontal trellis. Where brown spot is troublesome the horizontal trellis facilitates control measures encouraging a more open type of vine.

moisten the soil around the roots as soon as planted. Should hot, dry weather occur shortly after planting, it may be necessary to provide temporary protection from the sun.

The first summer is a most important period in the growth of the vines. It is necessary for them to become established and make sufficient growth to be well up on the trellis before the following winter. Adequate moisture supplies should be maintained and light dressings of nitrogenous fertiliser such as two or three ounces of sulphate of ammonia or more liberal dressings of fowl manure applied at intervals around each plant to keep them growing strongly.

### TRELLISING

Two main systems of trellising are used, namely vertical and horizontal, and various modifications of these have been tried. The vertical type most commonly used here has two wires, one about three inches from the top of the post and the other between 18in. and

2ft. below it and these are strained through holes bored in the posts. This type of trellis has been popular because of the limited materials required and its simple construction. The posts are set 6ft. out of the ground and placed equidistant between the vines. Substantial strainer posts and heavy gauge wire—usually ten gauge—are required because of the very heavy strain which is placed on the trellis when the vines are in full bearing.

In a slight variation of the above system, two wires are run about 6in. apart horizontally along the tops of the posts usually through holes bored on either side of the post. In this case it is usually necessary to have a third wire about 2ft. from the top to prevent the vines swinging about in the wind.

Horizontal trellises are also extensively used and differ from the vertical type in that two or more vines are run through T pieces fixed to the top of each post. These T pieces may vary considerably in size but 12 to 15in. is usually sufficient. The horizontal

trellis has the advantage that it allows mature vines, as well as allowing dead leaves to fall to the ground thus helping in the control of the brown spot fungus and from this point of view is favoured.

### MANAGEMENT

#### Training the Vines.

—Once the young vine has established itself after transplanting it will commence to grow and a number of shoots will form at the base. One or, if desired, two of the strongest are selected and all other growth is suppressed. Fix a strong stake



A narrow type of horizontal trellis. If wide posts are used the wires may be run through holes bored either side at the top of the post.

firmly beside each vine long enough to reach the upper wire and tie the shoots to it. As the shoots elongate, tie at intervals to the stake and remove lateral shoots which develop, but do not remove the leaves on the stem.

In the case of the vertical trellis, if one shoot has been selected, then two laterals are allowed to develop in opposite directions when the lower wire is reached and the main shoot is allowed to extend until it reaches the top wire when the growing shoot is pinched out and two more laterals are allowed to develop one each way along the wire. If two main shoots were used initially, then one is pinched when it reaches the lower wire and the other when the top wire is reached. Whichever method is used the result is one or two main stems and two main arms on each wire.

Where a T-trellis is being used, the shoots are trained in the same way up to the wires where the growing tips are pinched out and laterals allowed to develop, the main arms running in opposite directions along each wire.

Once the main framework has been formed the vines are encouraged to spread the full length of each panel. The laterals which form on the main arms hang down each side of the trellis and gradually produce a complete wall of foliage.

**Manuring.**—As with tree fruit crops, the main manurial response of passion vines is to nitrogen. This is no doubt due to the ready availability of nitrogenous fertilisers. Phosphate and potash are largely fixed by the clay fraction in the surface layers of the soil and, with the limited root growth in this zone as a result of cultivation and the lack of moisture the availability of these elements is restricted.

The soil organic matter should be maintained at a high level and the most economical way of doing this is by the growing of cover crops. New Zealand blue lupins are ideally suited for this purpose and produce a large bulk of green material. The crop should be turned in not later than the flowering

stage and under no circumstances allow it to compete with the vines for moisture or nutrients when they are commencing their spring growth.

The nutritional requirements of the vines may be best met by applying up to 2cwt. each of superphosphate and potash per acre when sowing the cover crop in the autumn followed by 2cwt. of sulphate of ammonia per acre with the spring cultivation. If irrigation is available, lighter dressings of sulphate of ammonia may be applied during the early summer months as determined by the vigour of the vines and the colour of the foliage. If desired an organic source of nitrogen such as blood and bone or fowl manure may be substituted. In early districts where following the harvesting of the summer crop the vines make new growth and set a late winter crop the application of a nitrogenous fertiliser in March is beneficial.

**Cultivation.**—The passion vine is a relatively shallow-rooted plant and deep cultivation can have nothing but a harmful effect. The cover crop should be lightly disked in, even if the whole of the plant material is not buried, so long as the plants are killed. Subsequent working of the soil should be restricted to the control of weed growth which is very important where summer irrigation is limited. No good purpose is served by continual summer cultivation simply for the purpose of stirring the ground.

**Irrigation.**—The fruits of the passion vine are very subject to wilting if moisture supplies are inadequate during the summer months, and considerable losses of fruit and some defoliation can occur from this cause. The condition is most severe where the vines are carrying heavy foliage growth, which results in the withdrawal of moisture from the fruit during times of stress. Therefore, where the soil is likely to become dry for any length of time, irrigation is essential for satisfactory crops. In warmer districts irrigation is also useful in forcing autumn growth for the production of a winter crop.

Furrow irrigation has been most generally used but sprinklers are also satisfactory particularly where the slope is too steep for furrows.

Excessive watering must be guarded against because of the risk of encouraging the Brown Spot fungus and where this disease is prevalent furrow irrigation is preferable to sprinklers.

**Pruning.**—There is no evidence to show that pruning increases the size of the crop, but from the point of view of disease control and the prevention of mechanical damage to fruit, some pruning is necessary. The amount of pruning required and the optimum time for carrying out the work will vary according to the conditions prevailing in each district.

In warm districts, where the summer crop is harvested by February, it is possible to prune the vines after picking is completed and obtain a regrowth before the cold weather sets in. In cooler areas harvesting may not be complete until early May and it is then too late to prune before the vines enter a semi-dormant condition during the cold weather when they do not respond to treatment.

Heavy pruning carried out during the winter can have disastrous results and therefore in late districts the work is left until the commencement of the spring growth. From the point of view of brown spot control, spring pruning is an advantage since it enables better penetration of sprays applied at this time. The aim should be to remove dead and diseased tissue, also any growth which will allow fruit to drag on the ground, and generally thin out spent fruiting wood to let light and air into the vine, and enable dead infected leaves which have lodged in the vine to drop to the ground.

The fruit is borne on lateral shoots produced from the previous seasons growth and, where this is long and trailing, it should be shortened back. However, excessive shortening of the fruiting wood is not necessary. It is not

as a rule possible to give each vine individual attention, and one practical method of pruning is to shear off all growth to within about three feet of the ground. After a few days it is possible to detect canes entwined in the remaining growth which have been severed from the plant and require removing and at the same time a general thinning is carried out according to the density of the growth.

**Cropping.**—Vines planted in spring should make sufficient growth during the first summer to flower and set a few fruits for the ensuing winter. However, the first commercial crop will be harvested during the second summer when the vines may carry up to half a bushel per vine. By the third summer up to a bushel per vine can be expected and thereafter crops of one to three bushels should be borne each summer.

The main crop of fruit is harvested during the summer and autumn months, from January till May according to climatic conditions, but in many areas a small winter crop is also produced. Where it is desired to increase the winter crop pruning should be delayed until late October or early November and, provided good growing conditions prevail, a much larger winter crop should be produced. However, this will be at the expense of the summer crop which will be considerably reduced. It is usually possible to pick a few fruits during most of the year.

Under favourable conditions an acre of passion vines in full production will yield up to four tons of fruit equivalent to approximately 250 bushels.

**Marketing.**—There are two avenues for disposal of passion fruit, namely the fresh fruit market and the processing factory. The factory is interested in bulk quantities available in the summer and during the remainder of the year when supplies are short and prices proportionately high the fruit is sold on the local market.



Healthy vines will produce heavy crops.

Fruit intended for local market should be fully ripe when harvested. In the summertime, this entails gathering the fruit each day since when ripe the fruit falls to the ground and, unless gathered promptly, it becomes sunburnt and useless. At the same time all well-coloured fruits which come away readily from the vine should be picked. In the cooler months of the year the fruit ripens more slowly and less frequent harvesting is necessary.

For local market the stems should be retained and the fruit carefully handled to prevent bruising. If it cannot be packed the same day the fruit should be stacked in a cool portion of the shed and covered to prevent excessive drying. In hot dry weather, pack at least every two days or the fruit will commence to crinkle and its market value will decrease. The fruit should be properly graded to remove all diseased, badly blemished or misshapen fruits and sized before packing.

There is no standard container for marketing passion fruit, but either the half-bushel dump case or the three-quarter bushel flat case is usually used. In the off season, quarter bushel cases are often used. The fruit requires careful packing to prevent damage in transit and should be delivered to market with a minimum of delay.

For factory purposes the fruit is not required fully ripe but should be picked as soon as coloured and may be partly green. This means that picking can be carried out much less frequently than for the local market. Grading is necessary as for the local market, removing all diseased, sunburnt or poor quality fruit. The stalks should also be removed but no sizing is needed other than rejecting the very small fruit. The fruit is usually forwarded in corn sacks.

**Diseases.**—The most widespread and also the most serious disease with which the passion fruit grower has to contend is brown spot. It is found wherever

passion fruit is grown, although certain plantings may remain free from the disease for years while others in the same district receiving similar attention may be badly affected. Usually in a new planting, brown spot does not become evident until the second or third summer and then is not serious enough to cause alarm. Unfortunately, once established, the disease spreads very rapidly so that whereas the first year it is noticed it may not appear of much consequence, unless proper control measures are taken the following year it may ruin a large proportion of the crop and eventually if neglected cause the death of the vines.

The fungus attacks the leaves, stems and fruit causing defoliation, shrivelling and dropping of the fruit and rapid decline in the productivity of the vines. Although signs of the disease may be seen at almost any time of the year as small brown spots on the leaves, the effects are most noticeable in the spring and summer months. Prevention is definitely more successful than cure and unless suitable measures are taken before the disease obtains a hold it may be impossible to prevent serious infection.

Control measures consist of thinning out the foliage during the spring to allow better circulation through the vines and thorough spraying at intervals during the spring and summer months with Bordeaux mixture of 4:4:40 strength. For this purpose a good spray plant capable of supplying sufficient pressure is essential. For full details of the disease, reference should be made to the leaflet dealing with this subject.

Sclerotinia stem rot is occasionally found attacking passion vines causing a shredding of the bark and where the main stem is affected the whole vine usually dies. It is also found attacking such plants as New Zealand Blue lupins and this may supply the source of infection. The control measures for the disease are covered by the requirements for brown spot but damage to the main stems by implements should be avoided.

**Trace Element Deficiencies.**—In certain areas, deficiencies of trace elements, namely copper, zinc and manganese may occur. Symptoms usually include, apart from unsatisfactory growth, a yellow interveinal leaf mottling and where these conditions are found the grower should consult the local Horticultural Instructor regarding measures to be taken to overcome the trouble.

## CONCLUSION

Passion fruit vines are probably best grown in conjunction with other forms of horticulture or grazing and as such can prove very profitable. There are good prospects for expanded production and increased plantings are required to meet the demand for fruit.

Five acres of vines are about as much as one man can manage successfully and then some assistance would be needed at the height of the harvesting period, particularly if the fruit were sent to the local market. However, in view of the various hazards with which the grower is likely to be confronted, it is often wise to plant one or two acres first and then gradually increase the area in succeeding years. As portion of the planting goes out of production so a young section is coming in to take its place.

By this means there will always be a proportion of young vines and it will be easier to maintain a more uniform production. No method of planting will overcome the necessity for adequate attention to disease control and while in some instances diseases are not troublesome, the grower must be prepared to combat them if passion fruit growing is to be maintained on a sound economical basis.

The cost in labour and materials of establishing a passion vine plantation is considerable and although the vines yield a quick return, without proper attention their life may be short. If passion fruit growing is to be financially

sound then the grower must be prepared to apply sound management methods and under these conditions increased plantings are recommended.

### ACKNOWLEDGMENTS

Acknowledgment is made to the various growers who enabled suitable

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## STORAGE OF ONIONS

The importation of onions at high prices during periods of scarcity may be avoided entirely as a result of some successful cool storage experiments recently undertaken by the Vegetable Branch of the Department of Agriculture.

Through the summer glut period it has often been necessary to export West Australain onions, sometimes at prices which showed a loss to the growers, while later in the season onions were imported from the Eastern States or from overseas sources.

In the experiments, approximately five tons of onions provided by the W.A. Onion marketing Board were placed in cool storage and kept at a temperature of 32° to 34° F. The onions chosen were four lines of the variety Spearwood Brown Globe harvested in mid-February. Two were selected lines and two were fair quality only. Half of each line of onions were stored in crates and the other half in bags.

Cold storage was commenced at the end of March and continued until the end of July, a period of four months, thus making a total of five and a half

months from the harvesting to the completion of storage. The onions were retained under normal shed storage for a week after the conclusion of the trial so that any undesirable after-effects resulting from cold storage could be observed. The onions were then placed on the local market.

It was noted that the low storage temperatures almost completely inhibited the development of shoots and that the onions retained an attractive appearance. The flavour and eating qualities did not appear to be affected.

The onions were check weighed after storage to ascertain shrinkage losses and where necessary they were picked over, and any deteriorated onions removed and weighed. The onions stored in crates showed no losses due to shrinkage and only a 1.4% loss from wastage. Those stored in the bags showed a 2.6% loss from shrinkage and a 3.8% loss due to deterioration. These losses compare favourably with those incurred with potatoes during storage and the storage of potatoes has been a regular practice in this State to assist in the distribution of supplies.

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### A REMINDER

**H**AVE you registered your orchard? One fruit tree or a single vine is an orchard for the purposes of the Plant Diseases Act and must be registered accordingly. The registration fee for less than one acre of trees or vines is 1s. Apply Department of Agriculture, Perth.

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# LAWNS

## *Their Establishment and Management*

By H. G. ELLIOTT, Dip. Agric., Assistant Superintendent of Dairying

**I**T may be said that there is nothing more pleasing to the eye than a well kept lawn, be it in a home garden or covering a sporting area, and under Western Australian conditions there is no reason why a good lawn or turf cannot be developed and maintained—always provided that there is a sufficiency of water and proper care and attention are available.

Three major factors control the production of good lawns and these are climate, soil and management. Each of these factors is responsible for a whole series of direct effects upon the growth and quality of the turf grasses.

The growing and maintaining of a good turf on playing areas implies not only a thorough knowledge of the relationship and response of grass to the environment and the way in which it is handled but also an ability to adjust such knowledge to the demands of play—which unfortunately are directly opposite to what is best for the grass. For example, compacting the area by implements and play under unfavourable conditions, close cutting, scarring and damage by players may necessitate wide modifications of maintenance practices to compensate for their injurious effects.

### CLIMATE

The conditions generally in this State are those of winter incident rainfall with summer drought, consequently in most areas where a turf or lawn is grown, irrigation during the summer months is necessary.

Temperature and moisture are the major climatic factors controlling species adaptation. Temperature is the most important factor, for generally sufficient moisture can be supplied by irrigation to maintain a satis-

factory turf even in the driest areas. Consequently buffalo or couch grasses will and do produce an excellent lawn or turf in the South West with irrigation. Kikuyu, Kentucky blue and bent grasses are also used under certain conditions.

### SOIL

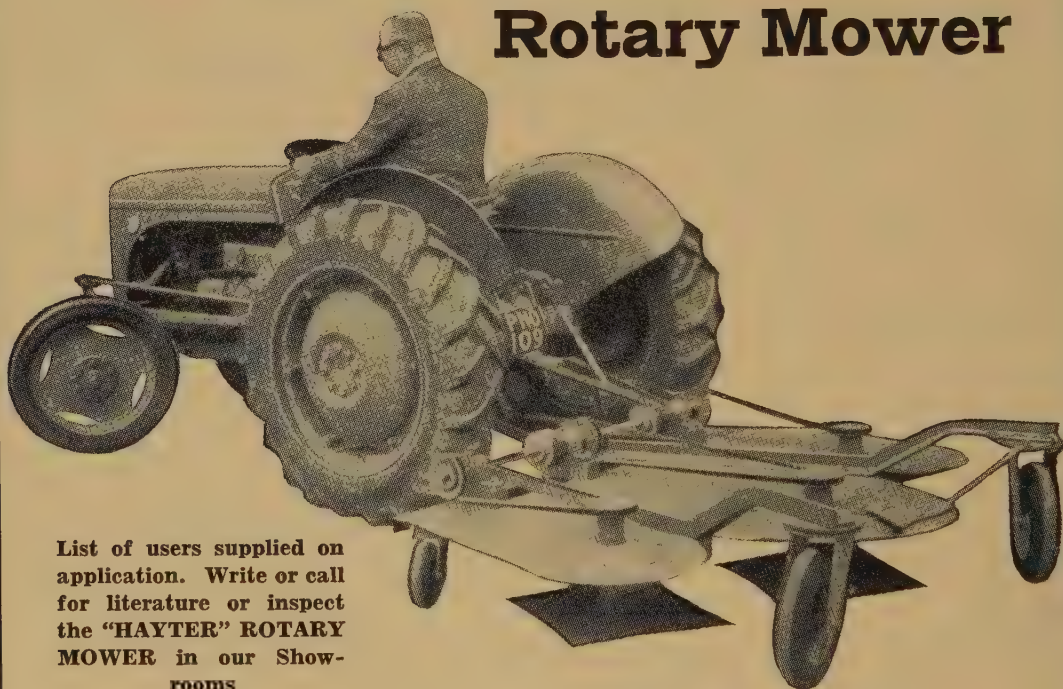
As we can control climatic conditions to a very limited extent only, the relationship of soil to the growing grass assumes major importance. These soil conditions may and can be modified or altered to an extent that will make them suitable for turf production. For instance fertiliser applications will make certain nutrients available; acidity can be corrected by lime applications, while drainage, cultivation and the use of organic materials improve the physical conditions of the soil. Soil moisture is increased by watering. The addition of good loam to sand or vice versa will improve the soil texture, and effective aeration may be ensured by the use of suitable implements.

It can be said that the most satisfactory conditions for all species of turf grasses are fertile soils that are permeable and well-drained yet of good water-holding capacity where the roots function. However, if the correct choice of a grass is made, a good lawn or turf can be produced under a wide range

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of conditions as most difficulties and deficiencies can be overcome by correct treatment.

## MANAGEMENT

This covers establishment, maintenance and renovation. Good management consists of a thorough knowledge and application of planting, clipping, fertilising, watering, rolling, aerating, topdressing, etc. The production of a good lawn or playing turf is a practical job, but to provide the answers to the many problems which must occur, much research work must be carried out and the knowledge already gained passed on to those most vitally interested.

### BASIC SOIL FACTORS NECESSARY FOR GOOD LAWNS

These factors can be listed as follows:—

1. Well-prepared seed bed. This is essential for all grasses. The seed bed should be firm and fine in texture.

2. The soil should be well-drained and not excessively compacted. This to allow good aeration, as grass roots need air for healthy vigorous growth.

3. The ground should have a good moisture-holding capacity even where irrigation is practised, as excessive drying-out must be avoided.

4. The fertility of the soil must be adequate as it must supply plant food throughout the year. Adequate fertility and an efficient fertilising programme must be maintained for the grass requirements.

5. Freedom from harmful chemicals in the soil is necessary. Salt, and any form of high acidity or alkalinity must be corrected if good turf is to be produced.

## FERTILISERS

Correct fertilising is one of the most important factors in turf management. The maintenance of a good turf means adequate feeding without interruption during the whole of the time it is growing, and under our climatic conditions

this can be for 12 months. To maintain a successful feeding programme for lawns it is necessary to understand fertiliser materials and grass requirements.

Fertilisers contain one or more of the three most important elements, nitrogen, phosphorus and potassium. These are not in pure forms but in chemical compounds combined with other elements. They may be natural, manufactured, or produced as by-products and they are classified as organic or inorganic.

Inorganic or chemical fertilisers in general are highly soluble and quickly available. It has been found that for lawns generally, a fertiliser mixture consisting of—

7 parts by weight sulphate of ammonia,

4 parts by weight superphosphate (22%),

1 part by weight muriate of potash, is an excellent one but some people like to use some organic fertiliser with the chemical one and for this purpose the following gives the same nitrogen, phosphorus and potash content—

3 parts by weight blood and bone.

6 parts by weight sulphate of ammonia.

2 parts by weight superphosphate (22%).

1 part by weight muriate of potash.

Generally, for best results, these fertiliser mixtures can be used at 3 oz. per square yard per year, but for preference three or four applications of three-quarters to one ounce per square yard should be applied.

Fertiliser firms do put up fertiliser mixtures which are usually prepared for certain agricultural crops but the special mixtures for lawns or turfs are limited, as generally there is a vast difference in the requirements of a lawn or turf. For example an oval and a golf green would require different treatments. On golf greens the management is intensive, as quick and constant growth is required. Apart from this,

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greens have different types of grasses to ovals—grasses chosen in each case for their specific purposes—therefore, they require fertiliser mixtures to meet the feeding requirements of the individual grasses. For example, couch and creeping bent require constant and liberal supplies of quickly-available nitrogen but Chewings fescue will do well on limited amounts. The recommended complete fertiliser mixture for a creeping bent green on a golf course in this State is as follows:—

3 parts by weight of sulphate of ammonia,

1 part by weight of superphosphate,

1 part by weight of muriate of potash,

or if an organic fertiliser is required with the chemical, blood and bone could be incorporated and the following mixture used:—

12 parts by weight blood and bone.

34 parts by weight sulphate of ammonia.

6 parts by weight superphosphate.

13 parts by weight muriate of potash.

Either of these mixtures to be applied to the greens at the rate of  $\frac{1}{2}$  oz. per square yard per month. This is equivalent to 16 cwt. of the mixture per acre per year.

### LIME

Soil acidity or alkalinity directly affects the health and vigour of lawn grasses and can also, owing to its influence on the availability of plant foods, indirectly affect growth. Periodic applications of lime based on pH tests is the best way to avoid excessive acidity, but as a general rule home lawns do not require much attention in this respect. On those areas where it is required, the best time for the application of lime is in the late autumn or winter months.

### HOME LAWNS

In this State home lawns consist mainly of buffalo grass but some people use couch and a few kikuyu grass. Ow-

ing to the long summer drought period which occurs the use of other lawn species such as the bents, fescues, and blue grasses is limited. Apart from the climatic conditions much more attention is necessary to maintain the last mentioned as they are more exacting in their soil requirements and need specialised fertilising and the control of weeds, insects, and fungus pests is essential.

In order to obtain a good home lawn the following needs to be carried out when establishing—

1. **Soil Preparation.**—The area shall be well cultivated to a depth of 4 in. to 6 in., freed of weeds, levelled and compacted with a fine surface tilth.

2. **Fertilisation.**—Before planting, the whole area should be fertilised at the rate of 2 oz. per square yard with the following mixture—

3 parts by weight blood and bone.

2 parts by weight superphosphate.

1 part by weight muriate of potash.

This mixture should be worked well into the top 3 in. of the soil.

3. **Planting.**—Runners or rooted cuttings of buffalo or couch grass should be planted in rows 6 in. apart with 3-4 in. between sets. If desired couch grass seed can be planted in the late spring, summer or early autumn months. When planting by seed it is necessary to have a very fine surface soil tilth, which has been well watered prior to seeding. Mix the seed with at least six times its bulk of sand or white sawdust and sow both ways over the area to ensure that a good uniform cover is obtained. The usual rate of seed sowing is in the vicinity of one-fifth to one-quarter of an ounce of seed per square yard. After sowing it is essential, without overwatering, to ensure that the surface of the ground is kept moist. Light hand-watering night and morning with a fine-nozzled spray is recommended for this work.

4. **Maintenance.**—Once the area is reasonably well covered with grass runners it is necessary to lightly roll the area and then cut with the mower set high. Following these operations apply

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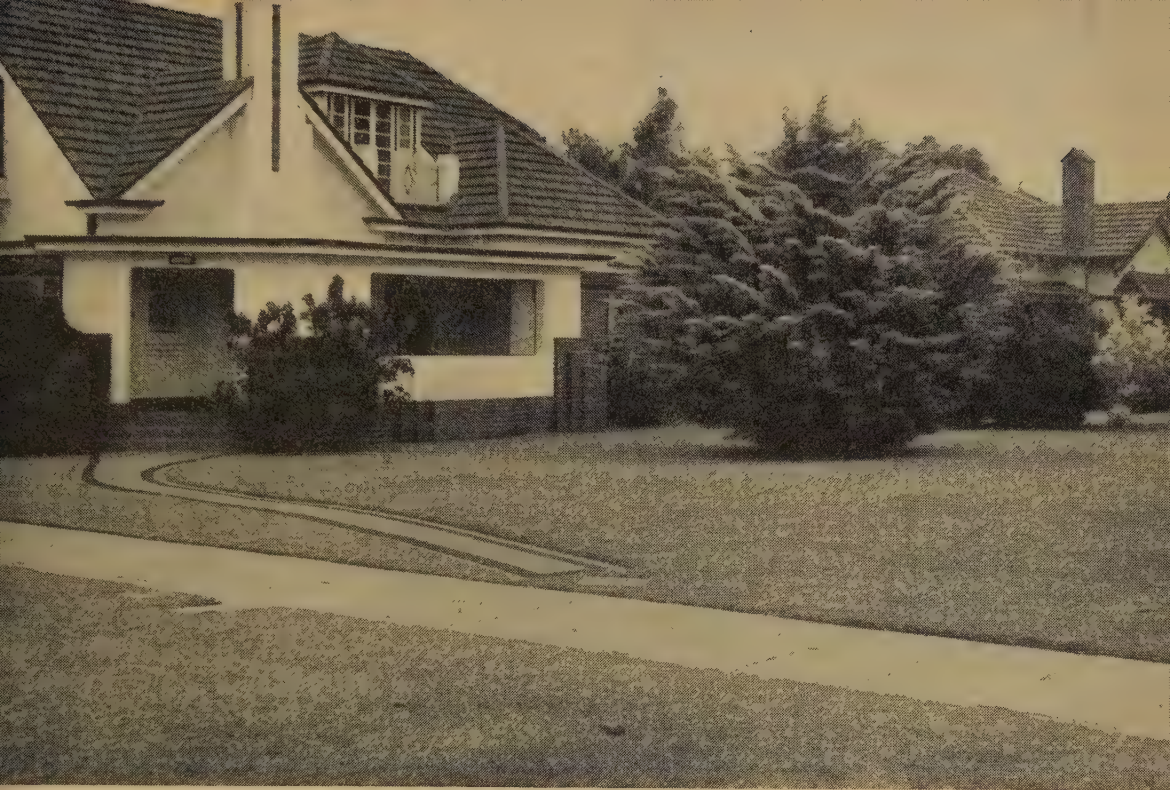
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another application of fertiliser but this time using a mixture of—

7 parts by weight of sulphate of ammonia,

4 parts by weight superphosphate,

1 part by weight muriate of potash,

at the rate of 1 to  $1\frac{1}{2}$  oz. per square yard and, after applying, top dress with clean sand to lightly cover the runners and level the area.

From this time onwards watering, cutting, and if necessary, light rolling should be done at regular intervals for three to four months. Watering should be gradually limited to two applications per week if in the summer time. Fairly heavy applications of water should be given at each watering.

**General.**—Once the lawn is established it is necessary to maintain efficient watering during the summer months and while active growth occurs at this period of the year cutting should be

carried out regularly and closely. In the early autumn a good application of about  $2\frac{1}{2}$  oz. per square yard of the following fertiliser should be used—

4 parts by weight sulphate of ammonia.

2 parts by weight superphosphate.

1 part by weight muriate of potash.

The period between cutting should be lengthened and the cutter bar lifted gradually until the spring months when closer cuttings can once again be made.

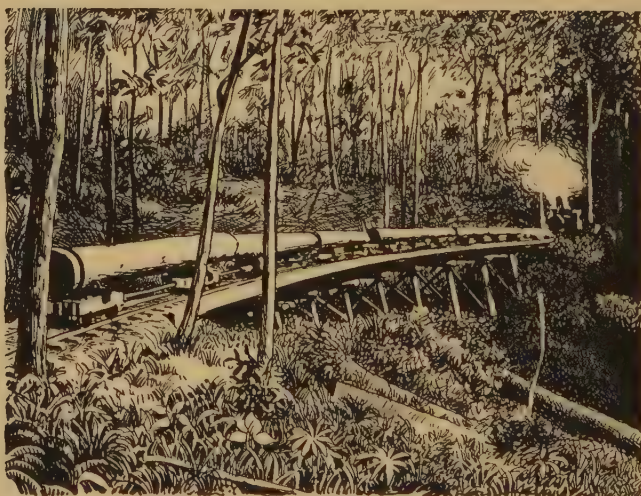
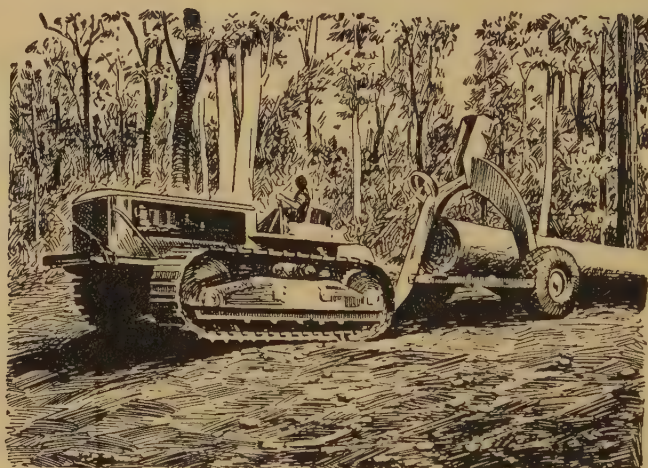
In the early spring, if the lawn is uneven, it can be levelled by giving a light sanding. Heavy blanketing of the area with sand is neither necessary nor desirable.

A further application of 1 oz. per square yard of the autumn fertiliser mixture can be applied to stimulate growth and, during the summer months at 6 to 8-weekly intervals, an application of  $\frac{1}{2}$  oz. per square yard of sulphate

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of ammonia will stimulate the lawn and maintain a pleasing colour in the grass.

**Weeds.**—Weeds in lawns are usually the result of inefficient management. If the turf grass is maintained at its maximum growth during the year, and more particularly in the autumn, very few weeds will be able to become established.

If, however, weeds such as clover, flatweed, etc. encroach on the area these can be treated with 2,4D hormone spray or dinox according to the makers' directions without harmful effect to the lawn.

Where heavy power mowers are used, rolling is not necessary, but if hand mowers are in use, rolling is advisable. This should be done two to three times a year and, if on sandy ground, after watering and cutting.

## TENNIS COURTS

Couch grass is the only grass which is used successfully as the main base for good courts in this State. Even then, if a good playing surface is to be maintained during the season, the maintenance and care of this grass is not simple as the surface of the court should be level, and the grass vigorous, but without blemish. Grass on a tennis court, for best results, must be well fertilised, cut, rolled, topdressed and watered.

**Soil.**—Most tennis courts in the Metropolitan Area are established on sand, and if good care and attention is given to the initial establishment of the area there is less likely to be major troubles later. Before planting, the area should be well worked to a depth of 6in. and a 2in. layer of good loam spread over the top. This loam should then be incorporated into the top 4in. of the sand with a rotary hoe or similar machine. When this has been done the area needs consolidating and watering, and finally it should have a fine loose tilth on the top  $\frac{1}{2}$ in. of the surface. Cuttings, roots or seed can be used to establish the couch over the

area. Prior to planting 3oz. per square yard of the following fertiliser should be incorporated—

- 3 parts by weight blood and bone.
- 2 parts by weight sulphate of ammonia.
- 1 part by weight muriate of potash.

Careful watering but not over-watering is necessary during establishment and after three months a further application of  $\frac{1}{2}$  to 1oz. per square yard of the following fertiliser mixture should be given—

- 7 parts by weight sulphate of ammonia.
- 4 parts by weight superphosphate.
- 1 part by weight muriate of potash.

If required, and good growth and cover is obtained light rolling should be carried out. To level the surface and cover the top runners a light topdressing of a mixture of sand and loam, three parts to one is to be given. Six to eight weeks later  $\frac{1}{2}$  to 1 oz. per square yard of sulphate of ammonia should be applied, and if required a further application at a similar interval is often beneficial.

The major fertilising should be given in the late summer or early autumn to stimulate growth during the winter months. This assists in reducing the incidence of weeds. A good general fertiliser for this time of the year is one made up as follows and applied at 3oz. per square yard—

- 3 parts by weight sulphate of ammonia.
- 1 part by weight superphosphate.
- 1 part by weight muriate of potash.

During the early spring a further  $1\frac{1}{2}$ oz. per square yard of this fertiliser should be applied and if necessary the area lightly topdressing with the 3:1 sand-loam mixture. Sulphate of ammonia should be used at the rate of 1oz. per square yard once or twice during the summer months as required to stimulate the grass.

**General Maintenance.**—Tennis courts at times have to stand up to a considerable amount of heavy play and

often abuse, more particularly when the courts are played on while damp or wet. The effects of this play bring about bare patches especially on the service lines and sometimes at the nets.

To avoid this the court area should be sufficiently wide and long enough to allow movement of the lines so that the same area is not used continuously and apart from this more care should be taken of the condition of the grass and soil of the courts before heavy and prolonged play takes place.

Where bad patches and bare areas occur these should be treated before they become too large. It is necessary to fork these areas to aerate the ground, fertilise and lace in good couch roots or runners and lightly topdress the areas with the standard topdressing mixture of sand and loam. It is essential that the same topdressing material be used in all operations at all times.

Every second year a liming of the whole area is advisable and the use of one bag of ground limestone per court is recommended. This should be applied in early July or mid-winter. Control of weeds by the use of weedicides should also take place during the recess periods.

Cutting should at all times be regular and the height of cutting altered according to seasons and growth. Close cuttings should only take place during the summer periods when the grass is most vigorous. It is essential to remove all grass clippings and to see that the mower is in first-class condition, as bruising of the grass should be avoided.

Watering must be efficient as over-watering is as harmful as under watering. During the summer months two waterings per week should be sufficient, providing the watering is efficient; approximately  $\frac{3}{4}$  in. per acre of water is required for each of the two waterings per week.

Rolling should be carried out with a medium weight roller, before watering but after cutting. Excessive heavy rolling is not required on tennis courts.

## BOWLING GREENS

The bowling green is probaly the most used and abused turf and it requires much attention and care to maintain it in a perfect condition, as the bowler requires a smooth, even, tightly clipped, fast surface at all times, regardless of seasons or climatic conditions.

The establishment of the green is the same as for a tennis court but it is recommended that once established fertiliser should be applied at four or five-weekly intervals at the rate of  $\frac{1}{2}$  oz. per square yard. The mixture to be used should be one containing a fairly high percentage of nitrogen. The following mixture is recommended—

- 2 parts by weight blood and bone.
- 6 parts by weight sulphate of ammonia.
- 1 part by weight superphosphate.
- 2 parts by weight of muriate of potash.

This mixture can be varied and replacing by one not containing blood and bone as follows—

- 3 parts by weight sulphate of ammonia.
- 1 part by weight superphosphate.
- 1 part by weight muriate of potash.

**General Maintenance.**—Wear ends and bare patches do occur on bowling greens and these are brought about by many factors including excessive play, using greens during the period when the surface is wet, or at nights when heavy dews occur, over-rolling, cutting too short or scalping the grass at the beginning or end of the season, together with incorrect fertilising and the use of unsuitable topdressing materials.

## OVALS

As a general rule these are used for cricket, baseball, football, athletics, etc. and have to stand up to heavy wear and tear at certain times of the year. It can be said that the football season in the heavy winter months does the most damage to the grass and also has a detrimental effect on the turf cricket



Play in progress on the West Australian Cricket Association's ground. An example of a playing area where good management has maintained an excellent area of turf

pitches on the oval but by efficient management, much can be done to avoid the heavy wear and tear.

The first consideration on an oval is to see that it is well-drained. Many curators in this State have the impression that as the oval is on sand it is naturally well-drained, but this is not the case. Years of play tend to pack the sand and during heavy rain the area frequently becomes water-logged in the winter months. The efficient use of well-laid agricultural drains is recommended.

One of the major problems of ovals when used in the winter time for football, etc., is the clay cricket pitches, as during wet weather these frequently become quagmires which the players dislike. Much can be done by the curators to make these areas firm and not the

present-day hazard to players. These turf wickets should be effectively drained and efficiently fertilised in the autumn and winter months to obtain and maintain a good grass cover. After play on wet days these wickets should be given attention by levelling and rolling them out.

The grass area on the oval should receive careful attention throughout the whole season so that it is maintained in first class order. To maintain the oval in this condition the following points will be of assistance.

1. **Fertilising.**—A good general fertiliser made up as follows is recommended—

- 7 parts by weight sulphate of ammonia.
- 4 parts by weight superphosphate.
- 1 part by weight muriate of potash.

This should be applied at the rate of 2 oz. per square yard in early April. It should be applied uniformly. If necessary an application of sulphate of ammonia can be given in early June at the rate of  $\frac{3}{4}$  oz. per square yard. A further application of the above mixed fertiliser can be applied at  $1\frac{1}{2}$  oz. per square yard just prior to topdressing the oval. During the summer months two dressings of sulphate of ammonia can be given, if required, at rates of  $\frac{3}{4}$  ounce per square yard at six-weekly intervals.

**2. Clover.**—The association of suckling clover with the couch grass is recommended for a good winter and spring green. Where not present the seed should be sown at the rate of 8 lb. per acre in the late autumn.

**3. Weeds.**—These will not be a problem on most ovals, providing the grass and clover is maintained at its maximum production. Where they do occur, however, every endeavour should be made to control them.

**4. Topdressing.**—The ideal playing surface is one which is firm yet resilient, but does not cut up with play. To obtain this it is necessary to gradually build up the oval with a topdressing mixture consisting of—

1 part by volume good loam.

3 parts by volume good yellow sand.

4 parts by volume good screened cinders.

This to be applied uniformly in layers not exceeding  $\frac{1}{2}$  in. between the football and the cricket season. This topdressing can be used for gradually levelling

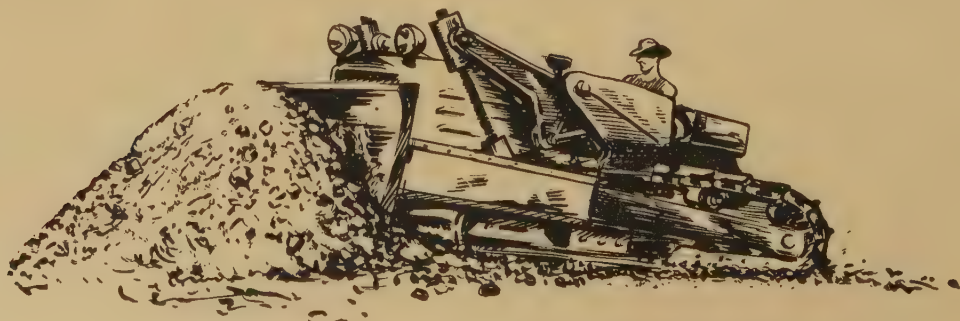
out depressions, etc. This mixture can be applied at any time during the summer months providing that it does not interfere with playing fixtures.

**5. Cutting.**—It is necessary at all times to have the mowers in good condition, and on good surfaces all grass cuttings should be removed and for preference composted. Short close cutting should only be done in the late spring, summer and early autumn months and should never be carried out in the winter.

**6. Watering.**—With watering the first essential is to have an adequate supply which can be applied uniformly and rapidly. Underground pipes with boxes for taps should be avoided. The best system is the use of the moveable on-top-of-the-ground pipe system. The application of about 36,000 gallons of water per acre per week in the summer months should be sufficient. In the hottest periods two waterings per week should suffice.

**7. Rolling.**—This may be necessary at certain times of the year. Heavy compacting will result if rolling is done after watering but as a general rule this is not necessary.

**General.**—When the oval has been excessively used for play and is partly torn about, smoothing over with a link mesh harrows is necessary to assist in filling in scars, etc. In some cases it may be necessary to use the top-dressing mixture on areas for filling in bad scars or depressions.



# GROWTH REGULATING SUBSTANCES USED FOR WEED KILLING

By G. R. W. MEADLY, M.Sc., Officer-in-Charge, Weeds and Seeds Branch

**M**ANY discoveries of considerable importance to agriculture have been made accidentally while scientists have been working on other problems. The presence of a hormone, or growth-regulating substance, in plants has been known for many years, and in 1934 chemists were able to define the composition of this substance. With this information it was possible to prepare synthetically many related chemicals which were applied experimentally to plants, mainly for the purpose of stimulating growth, particularly with a view to promoting root development of cuttings.

A considerable amount of success was achieved in this direction, but a chance observation has given rise to a practice of much more importance to agricultural production. It was noted that relatively large doses of these synthetic hormones not only failed to stimulate growth but resulted in the slow destruction of some plants. The term "relatively" should be stressed, as susceptible plants are killed by minute quantities. For weeds such as wild turnip (*Brassica tournefortii* Gouan.) and wild radish (*Raphanus raphanistrum* L.) the rate of application ranges from two to four ounces of active chemical per acre.

## NEW PRINCIPLE OF WEED CONTROL

The action of these substances introduces an entirely new principle to weed control. Most chemicals used for this purpose act as contact weed-killers destroying by corrosive action the tissue of the leaves and stems at the places of contact. The hormone-like substances, however, may be absorbed through the leaves, stems and roots and

the first effect may be noticed some distance from the point of entry. In the case of susceptible plants, violent physiological disturbances are caused, resulting in a variety of obvious changes including twisting and abnormal development often followed by swelling and bursting of the stems. Under favourable conditions plants such as wild turnip will commence to twist and wilt within an hour or two after application but generally the hormone-like preparations are slow-acting and, with some weeds, a month or more may pass before the plants die.

The action which takes place within the plant is not fully understood. The reduction of leaf and bud development can interfere with the vigour of the plant; there is evidence to show that the food reserves of starches are depleted rapidly and the abnormal cell divisions often result in a complete breakdown of the plant tissue.

One of the most important aspects of hormone-like preparations is the marked difference in their effects on different plants thus making them extremely valuable as selective weedkillers. Most grasses are highly resistant, while, in the

The availability of the following proprietary lines has been indicated to the Department of Agriculture by the distributors.

One pint contains 20 fluid ounces.

main, broad leaved weeds are susceptible, with members of the cabbage family providing extreme examples in this direction.

### WEEDKILLING NOMENCLATURE

In the wake of these discoveries has followed a number of names not previously known to farmers or, for that matter, to technical agriculturists and naturally some confusion has arisen. I will attempt to clarify the position. The chance observation referred to earlier was made in 1940 by workers in England while investigating the effects of spraying "growth promoting" substances on cereals. Some of the annual weeds were killed without affecting the cereal. This discovery was exploited immediately and by the end of 1942 two materials were selected as being the most promising. These were complex organic compounds with correspondingly difficult names—2-methyl-4-chloro-phenoxy-acetic acid and 2,4 di-chloro-phenoxy-acetic acid. The former is commonly known as MCPA and the latter as DCPA or 2,4-D.

Commercial preparations of MCPA are largely confined to the sodium salt which is used quite extensively for the selective control of weeds, particularly wild radish, wild turnip and mustard (*Sisymbrium spp.*) growing in cereal crops. In the case of DCPA or 2,4-D, however, several derivatives with somewhat different properties are being marketed. The sodium salt and amine are recommended for the treatment of weeds in cereal crops and on some occasions the ester is also used for this purpose. The ester, however, is noticeably less selective and is more likely to damage crops. It is often used for "spot" spraying of weeds that do not react readily to the other preparations.

More recently a related chemical has been used with success against woody plants such as blackberries. Chemically this is 2,4,5 tri-chloro-phenoxy-acetic acid but for convenience is known as 2,4,5-T and the ester is the type used most frequently. Some proprietary lines contain a mixture of the esters of 2,4-D

and 2,4,5-T but there is some doubt whether the mixed esters have any advantage over 2,4,5-T alone for woody plants.

A further growth promoting substance, sodium tri-chloro-acetate, commonly known as TCA is being used to advantage for the control of perennial grasses such as couch and kikuyu. The cost makes its use impracticable for other than small areas.

### ACID EQUIVALENT

Recommendations for the use of MCPA, 2,4-D and 2,4,5-T are usually made in terms of ounces or pounds of acid equivalent per acre. At first this may appear to create further difficulties rather than simplify the position. The necessity arises, however, because the large number of proprietary lines available do not contain the same proportion of active ingredient. It is essential, therefore, to specify the amount of active ingredient or acid equivalent for the spraying treatment to be carried out. The proportion in each proprietary line is known and therefore the amount to be applied per acre or to be added to a particular volume of water can be calculated. For example, if wild turnip is being sprayed at the rate of four ounces of acid equivalent in eight gallons of water per acre, one gallon of a preparation containing four pounds of acid equivalent per gallon is sufficient to treat sixteen acres, and should be made up to a volume of 128 gallons. The table at the conclusion of this article includes a number of proprietary lines along with information concerning their acid equivalent content and other details.

### SPRAYING HAZARDS

Although MCPA, 2,4-D and 2,4,5-T have the advantage of being neither toxic nor corrosive there is a risk associated with their usage. Many cultivated crops, particularly cabbages, tomatoes and grape vines are very susceptible and on a windy day sufficient spray drift to prove damaging can be

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carried a considerable distance. The risk applies particularly to the esters for, besides being generally more potent, they are also usually more volatile.

It is inadvisable to use orchard spraying equipment for the application of hormone-like weedkillers as it is difficult to remove traces of the chemicals which

could prove harmful to orchard trees during later spraying operations. If the unit is to be used for any other purpose thorough washing with a solution of washing soda is recommended.

Finally, seeds for sowing purposes should not be stored in close proximity to the chemicals.



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# DAFFODILS FOR EVERYONE

By C. C. HILLARY

**F**OR hundreds of years, poets and authors of renown in almost every country have extolled in verse and prose the loveliness of the daffodil. And well they might, since it is a floral gem of great beauty and one so widely grown that it might well be called everybody's flower.

It is a flower which has brightened countless homes and cheered many sad hearts—qualities which endear it to everyone. It picks well, lasts for a week and sometimes more when cut and placed in water, and is tolerant of a wide variety of soils and climates. What more could one want?

Daffodils are never seen to greater advantage than when naturalised in big drifts in woodlands, parks and extensive shrubberies. Except in very large gardens, however, the naturalisation of daffodils is almost impossible, but a happy compromise which usually leads to charming results in most small gardens can be arranged by planting clumps of daffodils under deciduous trees, round the base of shrubs, and in irregularly-spaced groups of varying size in border beds and alongside garden walks and paths.

Large clumps of from a dozen to two dozen bulbs are preferable to small ones, and a richer and more even flowering is obtained when one variety only is included in each clump. Bulbs in clumps should be spaced about six inches apart.

When daffodils are grown for exhibition or cut-flower purposes, their cultivation and accessibility are simplified if they are grown in beds about four feet wide of any convenient length, with 18 inches between the beds. The bulbs should be planted in rows spaced about a foot apart, with eight inches between the bulbs. If the ends of the

rows are marked with neat sticks, cultivation can be carried out even before the shoots show through the ground.

In very heavy soil and in low-lying localities the beds should be raised six inches above the level of the paths to assist the drainage.

## CULTIVATION COUNTS

Most experts agree that the chief factor in growing good daffodils is deep and thorough cultivation of the soil. The more the ground is cultivated prior to planting, the better the results are likely to be. To help maintain the degree of aeration conferred on the soil by thorough cultivation prior to planting, frequent hoeing between the rows should be carried out during the growing period.

Modern daffodils are so beautiful that they merit the best we can do for them as regards site and soil. A position where the sun shines for at least half the day should be chosen and it is an advantage if it provides some shelter from strong winds.

## MANURING

A good, friable loam is the most suitable type of soil, but almost any kind of sandy ground will grow good daffodils provided it is enriched sufficiently with old animal manure or a good leafy compost, plus reasonable amounts of blood and bone and sulphate of potash.

Potato manure (e) is also a suitable fertiliser for enriching soil for daffodils

and so is fowl manure, but when the latter is used it is essential that sulphate of potash (about a handful to the square yard) should be worked into the soil at the same time.

Whatever manures are used for enriching the soil, it is essential that they



Daffodils lend themselves to decorative arrangements in the home.

be placed below the bulbs. The best way of doing this is to remove the top spit to the depth of a spade and then fork the manures evenly and thoroughly through the lower layer of soil.

If one forking or digging does not mix the manures properly with the soil, then it should be dug or forked over again and the work on the second occasion should be commenced from the opposite end of the bed.

### PLANTING TIME

Depth of planting varies according to the size of the bulb, but the soil cover should never be less than twice the diameter of the bulb. Many experts consider that even deeper planting is preferable, especially when the bulbs are to be left down for two years or more.

It is always a good plan to surround each bulb with clean sand at planting time. This helps the drainage and prevents manures in the soil from coming into actual contact with the bulbs.

Except in the hottest soils, daffodil bulbs should be left undisturbed in the ground for two or three years. When the soil conditions are suitable, the flowers in the second year are almost invariably of better quality than those produced the first season after planting, and a moderately long stay in the ground encourages a better increase in bulbs. At the end of the third year the bulbs will probably be overcrowded and, when the next planting season arrives, the clumps should be lifted, divided, and replanted in fresh ground with suitable spacings.

Daffodils in dry climates require plenty of water during dry periods, and the ground must always be kept well moistened during flowering. Any dryness of the ground immediately before and during flowering invariably results in shortened stems.

When cutting daffodils, it is wise to carry around a bucket of water and plunge the stems in water as soon as they are cut. This will save loss of sap, prevent air entering the stems, and prolong the life of the flowers.

### MANY VARIETIES

There are hundreds of varieties of daffodils and most of them are beautiful. Some are very expensive and

varieties such as Trousseau, Green Island and Broughshane still cost several pounds per bulb.

Fortunately, there are many splendid daffodils available at prices cheap enough to place them within the reach of all. Among these are the lovely yellow trumpet daffodils King Alfred, Godolphin, Bells 15, Dawson City, and Golden City. All of these grow well in this State and can be relied upon to produce attractive blooms on good stems. They flower in the order mentioned and when all are grown they will provide a succession of blooms in the garden for a number of weeks on end.

Somewhat dearer, but well worth the extra money, are the yellow trumpets Elgin, Principal, Garron and Golden Wealth. These are exceptionally well-formed daffodils with splendid perianths and all of them have won awards on the show bench.

The all-yellow, large-crowned daffodils Havelock and Carlton are also well worth a place in every garden, and so is the lovely St. Egwin—a superb flower which is carried on the longest of sturdy stems. All three reproduce well and flower freely.

Two splendid white trumpet varieties are Beersheba, and Ardclinis. Both have long, frilled trumpets, and the flowers are well poised on stems of reas-



The trumpet blooms are always popular.

onable length. Cantatrice, with a shorter trumpet, is also well worth growing.

Bonython, a bi-colour trumpet, is another lovely flower. It is one of the most vigorous daffodils in my garden and seems to thrive well everywhere.

Among the red and orange-cupped daffodils there are many fine varieties. Jean Hood and Fortune are two which I can especially recommend. The

former has a perfectly-proportioned, white perianth, with an orange-red cup, and the flowers are carried on superb stems often two feet long. Fortune is a larger daffodil with a yellow perianth and orange-red cap. Both varieties multiply exceedingly well.

Other daffodils of merit which are well worth inclusion in every collection are: Polindra, Bodilly, Stronghold, Diolite, Daisy Schaffer, Porthilly, Sincerity, Effective, Flava, Bread and Cheese,

Killigrew, Tunis, Hugh Poate, and Carbineer.

All of the varieties I have mentioned are grown in Western Australia and can be obtained from one source or another.

In case you are asked what the difference is between a daffodil and a narcissus—there is none. All narcissi are daffodils and all daffodils are narcissi. Daffodil is merely the English name for narcissus.



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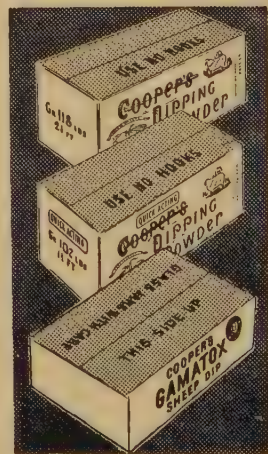
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# FARM FENCING HINTS



## 4—GATES AND GADGETS

By J. A. MALLETT

**A** PART from the fact that they add immeasurably to the appearance of a property, good gates are permanent assets—sound investments which pay generous dividends over the years, both in peace of mind and in the saving of many man-hours of valuable time.

When gates are unreliable, the stock cannot be depended upon to “stay put” and may roam with disastrous results to themselves or to crops. When a good animal becomes entangled in some of the barbed-wire atrocities which do duty as gates on far too many farms, its owner can easily lose a sum that would equip half a dozen paddocks with well-swung stock-proof gates.

When a farmer has to open and close a ramshackle gate three or four times a day on most days of the year, he is wasting time and effort which, in the aggregate, becomes a costly expenditure.

Undoubtedly, the factory-made, tubular steel gate fitted with vermin-proof mesh where necessary, is the best type of farm gate now available. Properly swung on sound gateposts, it needs little or no maintenance and will usually outlast its purchaser.

Admittedly, cost is a factor which we cannot always disregard and many farmers find it impossible to equip all gatesteads on a property with factory-

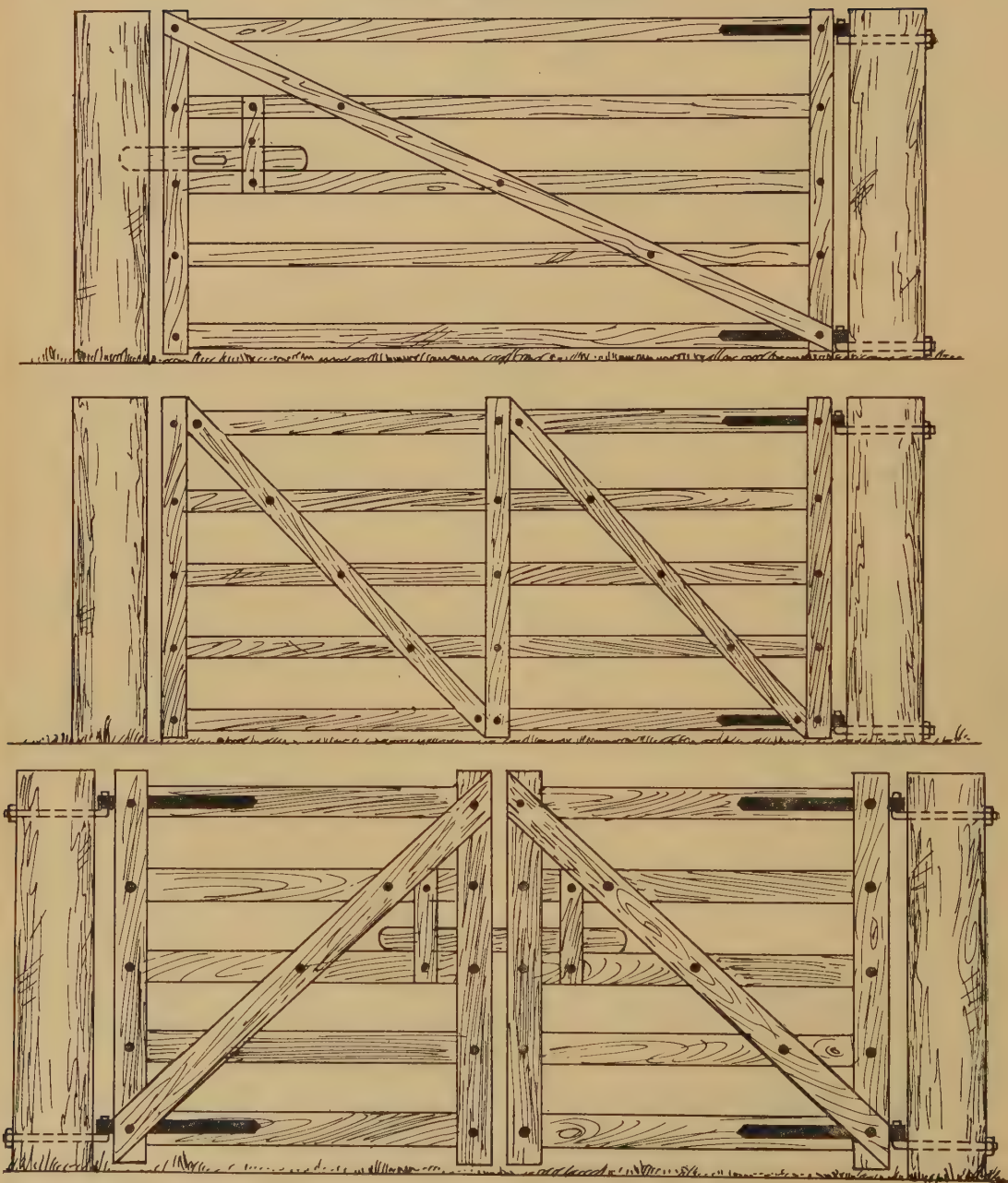
made gates. It is a wise move however to instal them as entrance gates, and wherever they are likely to be in fairly constant use.

Less frequently-used gates can be made easily on the farm from 4in. x 1in. or 3in. x 1in. timber, and Fig. 1 shows a few popular patterns. The uprights are doubled and the rails are sandwiched between them.

Where wide spans are needed, it is advisable to use two gates closing on to a central block, as long gates tend to lack rigidity unless they are very carefully constructed from stout timbers.

Using the 3in. x 1in. or 4in. x 1in. timber, with  $\frac{3}{8}$ in. bolts and washers, strong gates up to about 9ft. in width can be constructed. Stout hinges of the “hook and eye” type should be used and it is a good idea to have the hook portion made long enough to go right through the post with a fairly generous length of thread so that adjustments can be made to overcome any sag which occurs.

FIGURE 1.



In attaching the hinges it may be necessary to use spacing pieces, or to recess some of the timbers in order to provide a level base for the hinge. The diagonal struts may be duplicated to give extra rigidity and in rabbit-proofed paddocks this type of gate could carry netting but would need special attention so that rabbits could not pass under or around the gate. This would necessitate close fitting of the hinges, possibly with the addition of intermediate battens between the gatepost and the gate and also the fitting of a length of timber across the gateway to ensure that there was insufficient space for a rabbit to pass between the ground and the gate.

Such home-made gates if well constructed and, given a coat or two of paint, will give good service for many years.

Whatever gates are used, take special care with the supporting posts. Gates are usually swung on the strainer posts of the fence, but this method has little to recommend it save expediency. The tension of the wires is apt to cause movement of the posts unless they are exceptionally well stayed, and very little post movement is apt to be reflected in a considerable interference with the positioning of the gate.

Separate gateposts, preferably set in concrete, will help to keep gates properly swung, and ensure ease of operation and safe fastening.

### **"COCKY GATES"**

In paddocks where the volume of traffic hardly warrants the construction of orthodox swinging gates, the wire-and-dropper affair commonly known as a "cocky gate" will often meet requirements.

If well-constructed and kept in repair, these will fill a gap quite satisfactorily, but all too frequently they are badly-planned and allowed to degenerate until one has to wrestle with odds and ends of wire to open them, only to have them collapse in an untidy tangle of wood and wire that is

a menace to clothes and skin alike. Closing them is apt to be a two-man job with the result that they are often left precariously suspended and liable to fall down and become a danger to stock.

Even the "cocky gates" can be made reasonably safe and convenient to handle with very little trouble or expense. Obviously they should be taut when closed if they are to be effective.

Many of those seen on farms are merely secured by loops of wire at the top and bottom of the gatepost and when closing such gates one usually has to lift the bottom loop with one's toe, insert the lower end of the gate upright and then heave with might and main to bring the top of the upright to a position where the top loop may be slipped over it. The loss of sundry pieces of skin in the process is apparently regarded as a normal occupational hazard.

One step towards improving these gates is to make the bottom loop rigid

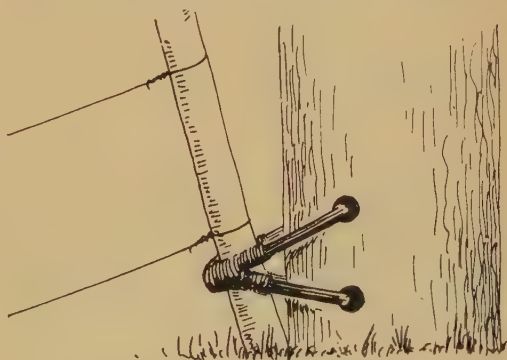
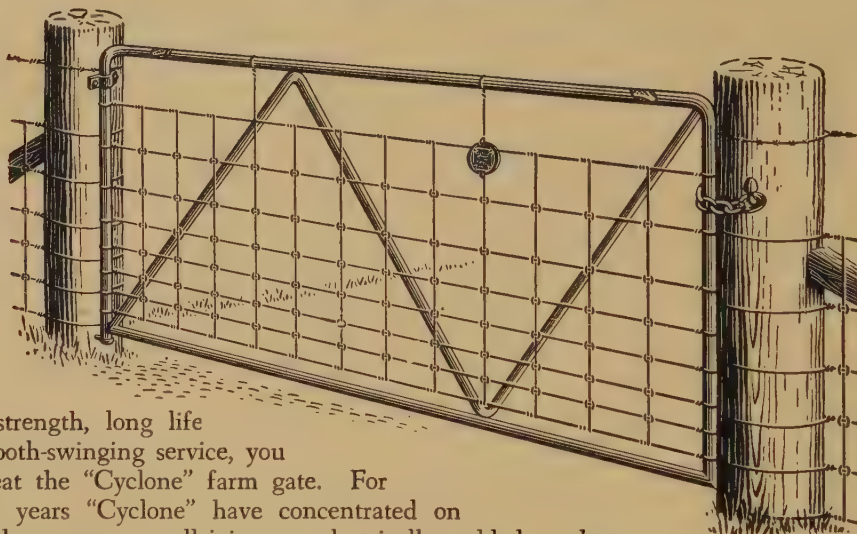


**FIGURE 2.**

instead of allowing it to dangle loosely. This is such a simple matter that I am surprised that it is not more frequently used. Simply bore two holes through the post, one about three or four inches above the other. Take a 5ft. length of fairly soft wire and pass it through the bottom hole, round to form a loop and then through the top

# There's nothing to match a genuine **Cyclone** gate



FOR strength, long life and smooth-swinging service, you can't beat the "Cyclone" farm gate. For over 50 years "Cyclone" have concentrated on making better gates — all joints are electrically welded — the heavy top and bottom hinges cannot pull or work loose — the special chain and knob fastening cannot be knocked or lifted off by stock — the "Ringlock" covering makes the gate sheep-proof.



## Look for the "Cyclone" RED TAG

Every genuine "Cyclone" gate carries the red tag illustrated at left. Demand the genuine, and make sure of a life-time of trouble-free gate service.

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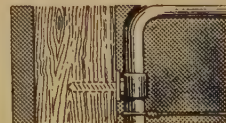
## FIELD GATES

**CYCLONE COMPANY OF AUSTRALIA LTD.**

Gipps Street, Abbotsford  
and at Sydney, Adelaide, Perth, Brisbane



Frame and cross members are welded into one solid unit.



Rugged coach screws hold the hinge straps firmly to the post.



Cyclone chain and knob catch cannot be operated by stock.

hole. It is brought round to form a second loop and then passed through the bottom hole again and this process is continued until you have a strong loop made of several strands of wire. Finish by binding the ends of the wire round the strands and you have a rigid loop which will last for years and into which your gate upright may be fitted with ease and safety. (See Fig. 2.)

An alternative to this method is to spike a section of heavy duty truck or car tyre to the post as shown in Fig. 3.

To secure the top of the gate upright any of the ideas shown in Fig. 4 will give good service. The use of a lever facilitates the tightening of the gate and all are so simple in construction that few written details are necessary. The levers are held in the "down" position by loops of wire or by a pin inserted in a hole drilled in the lever and the fence stay.

If you have any old main leaves from car or truck springs on the farm scrap-heap you could try out the idea shown in Fig. 5. Two lengths of  $\frac{3}{4}$  in. round iron are bent to form hooks and are then passed through holes bored in the gatepost in line with the "eyes" of the spring. The ends of the round iron are then bent over at right angles and engaged in the eyes of the spring which is then spiked to the gatepost. To enclose the gate the upright is hooked into position where it is gripped by the round iron and the action of the spring will hold the gate taut.

I have seen a similar effect obtained by utilising spiral springs from old drills. One of these is placed in position on each of the wires forming the gate and this permits the amount of "give" necessary to safely engage the upright in two suitable loops.

### SWINGING WIRE GATES

Various inexpensive compromises between the "cocky gate" and the orthodox swinging gate may be seen on farms and a few of the more popular types are illustrated in Fig. 6.

Bush timber may be used for most of them and the ingenious use of forked branches will often aid in obtaining the necessary degree of strength and rigidity. They may be used to carry wires and netting.

Bush or sawn timber may be used in example A which is a simple V-shaped gate carrying one or more uprights. The hinges may be simply made from four eye-bolts, two on the gatepost and two on the upright of the gate. A suitably sized steel rod passes through all four eye-bolts. Another pair of eye-bolts are used to make a catch for this type of gate. The point of the wooden V has a slot cut in it which slides over

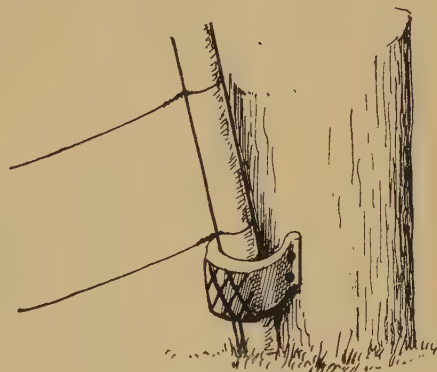
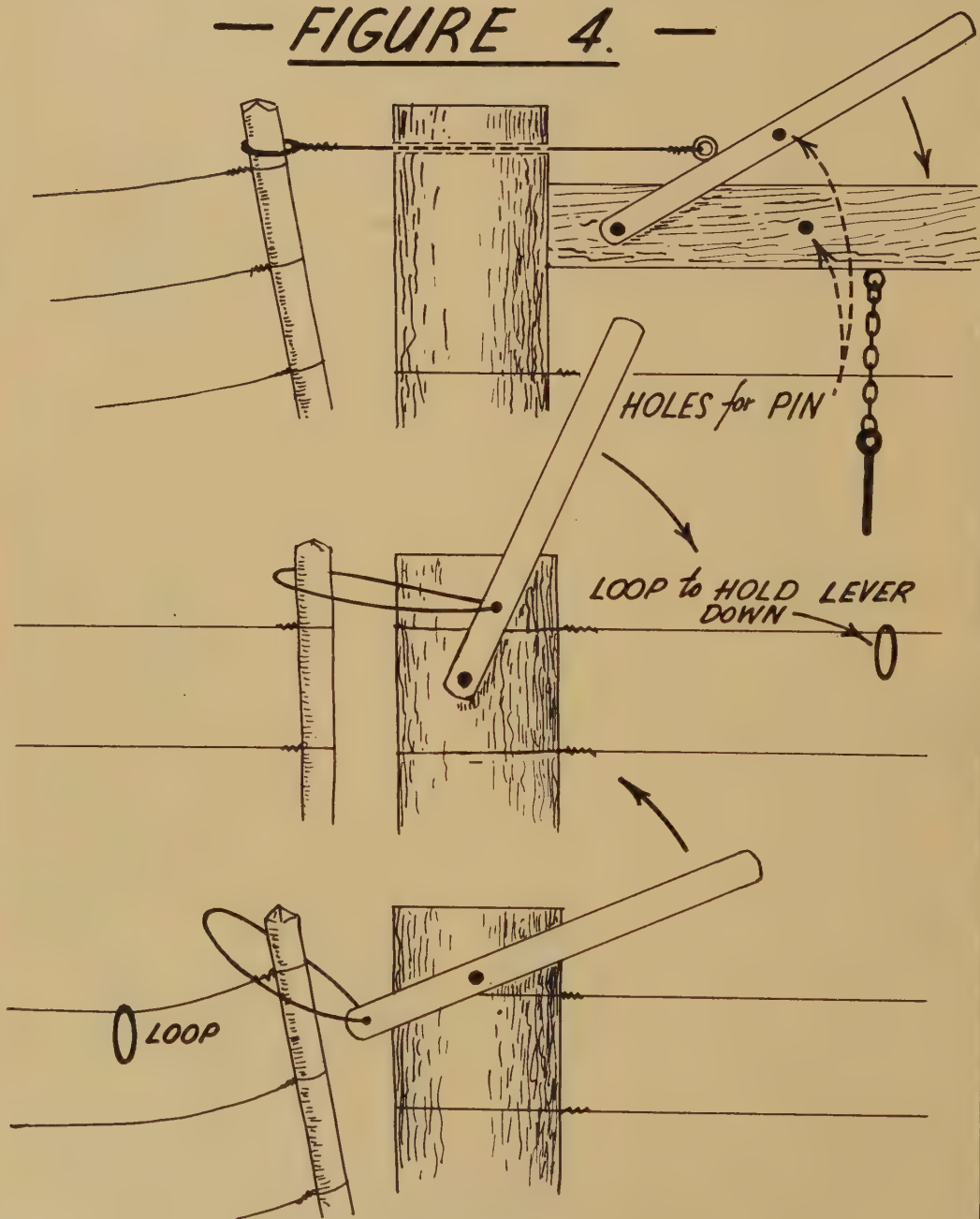


FIGURE 3.

an eye-bolt or staple-shaped piece of round iron in the strainer post. The other eye-bolt is slipped through the loop to hold the gate in position.

Example B makes use of a forked branch with another narrower fork used as an upright to support the gate when it is opened. This sketch shows another simple gate catch made from a U-shaped piece of scrap iron drilled with two holes to carry a pin. Still another idea is shown in sketch C which only has a single diagonal support. This is a somewhat less rigid type of gate, but one that is quite satisfactory, and the drawing shows still another type of simple catch and

— FIGURE 4. —



some improvised hinges. These are made by sinking a short log in the ground at the hinge end of the gate and drilling a hole to take a bolt with the head removed, or any suitable length of round iron. A stout board is spiked to the top of the gatepost and both this board and the top of the gate upright are drilled to take another bolt to complete the hinges.

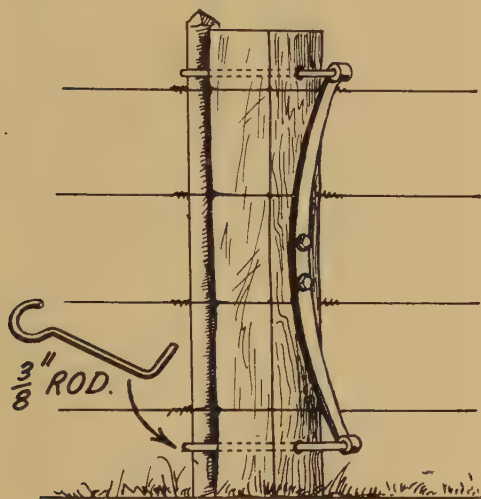


**FIGURE 5.**

Sketch D shows a simple arrangement of two cross-bars and two uprights although, as in most of these models, other uprights may be added if required. In this case the hinges are formed from eye-bolts and L-shaped pins while the fastening is a simple chain and peg.

### EXTRA WIDE OPENINGS

The ordinary farm gates could often be made much smaller and therefore much stronger were it not for the fact that occasionally it is necessary to take wide machines such as harvesters, drills and combines into the paddocks.

A simple method of overcoming this problem is to have a removable panel of fence of a suitable length at the

latch side of the gate so that a wide opening is always available when needed.

The strutted strainer post of the fence is erected at a suitable distance from the gate, and the extra panel is then attached to this post with the other end terminating in a removable post the base of which is shaped to fit into a length of 4in. or 5in. piping which should preferably be set in a concrete block. The illustration (Fig. 7) shows the details of this arrangement.

### FLOOD-PROOF FENCES

Serious damage is often done to fence-lines during periods of unusually heavy rainfall when large volumes of water swirl through valleys and other low-lying land.

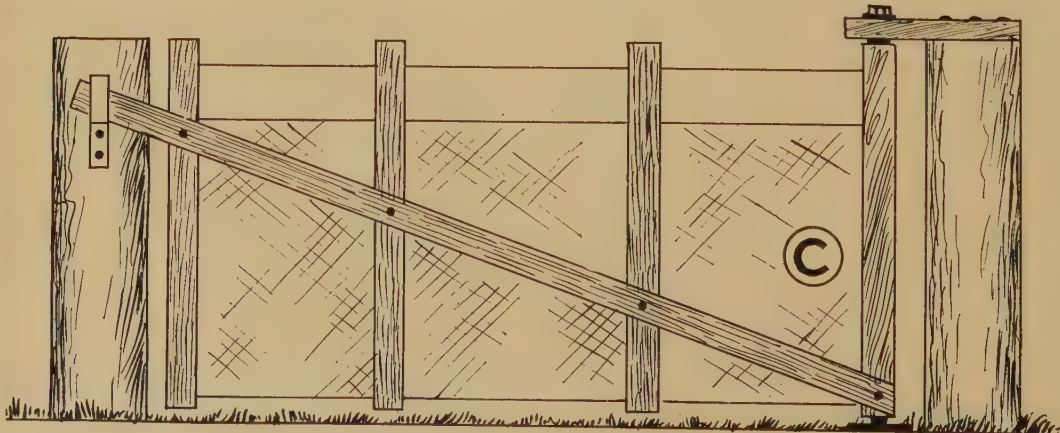
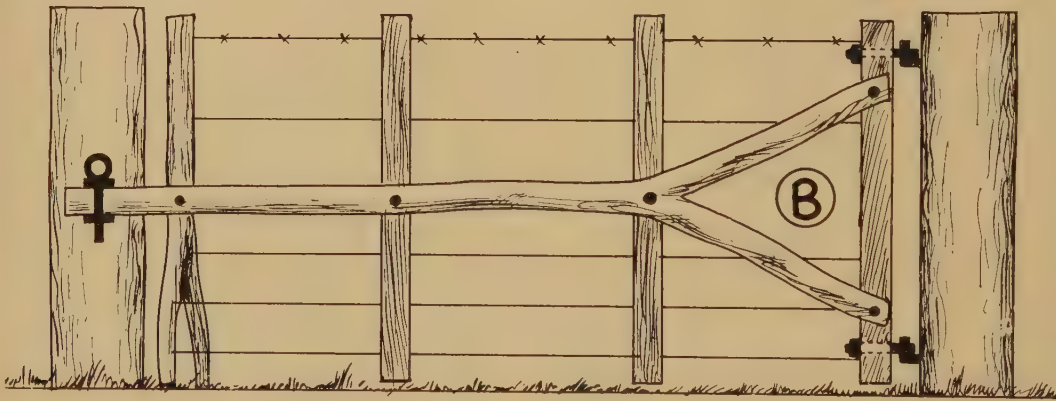
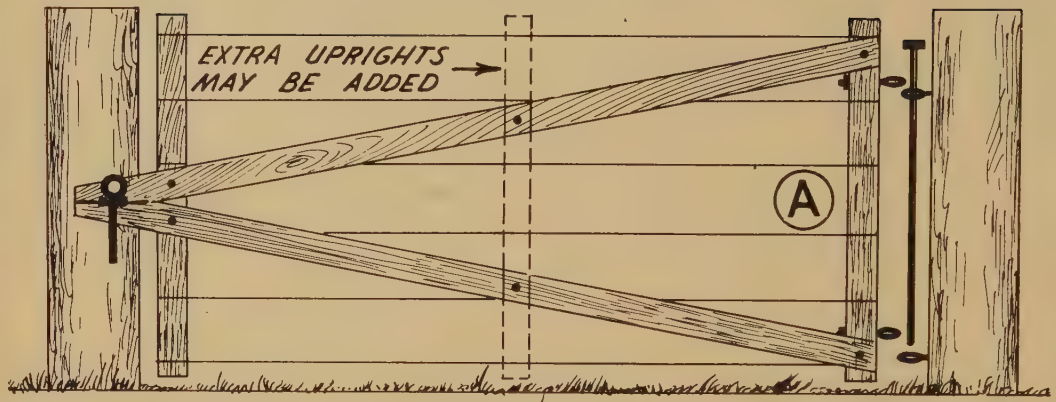
The floodwater cause debris to pile up against the fences in such quantities that eventually large sections of the fence collapse and become a tangled mass of posts and wire.

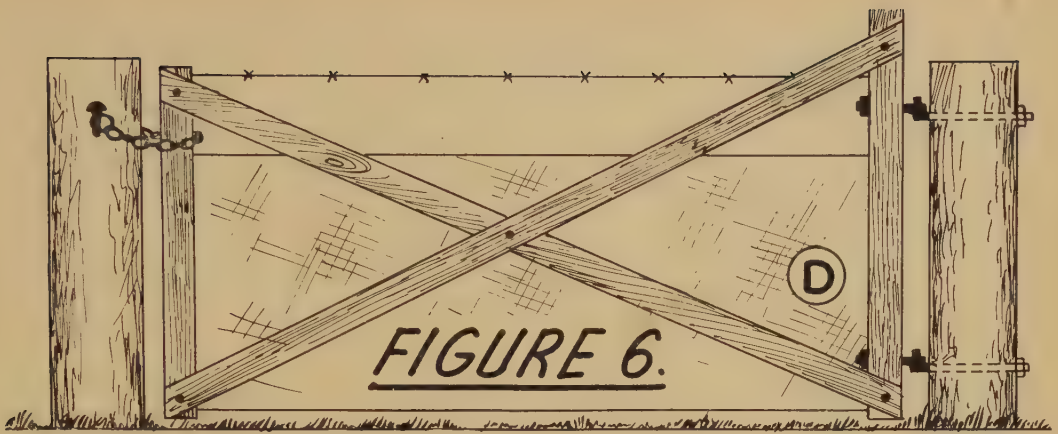
Damage of this nature may be minimised if sections of the fence in these flood-liaible areas are made so that they will fall flat when subjected to pressure, allowing water and debris to pass over them. When the floods subside, it is a simple matter to stand the fence up again.

The best method of achieving this is to plant strainer posts at each side of the lowlying land and strut them firmly so that the section of fence between them forms an independent panel.

Ordinary fence-posts are erected at suitable intervals across the channel, say about 33ft. apart preferably spaced more widely than those in the normal fence. These posts should be sunk well into the ground and should only be bored with two holes, one about four inches from the ground and one about a similar distance from the top of the post.

FIGURE 6.





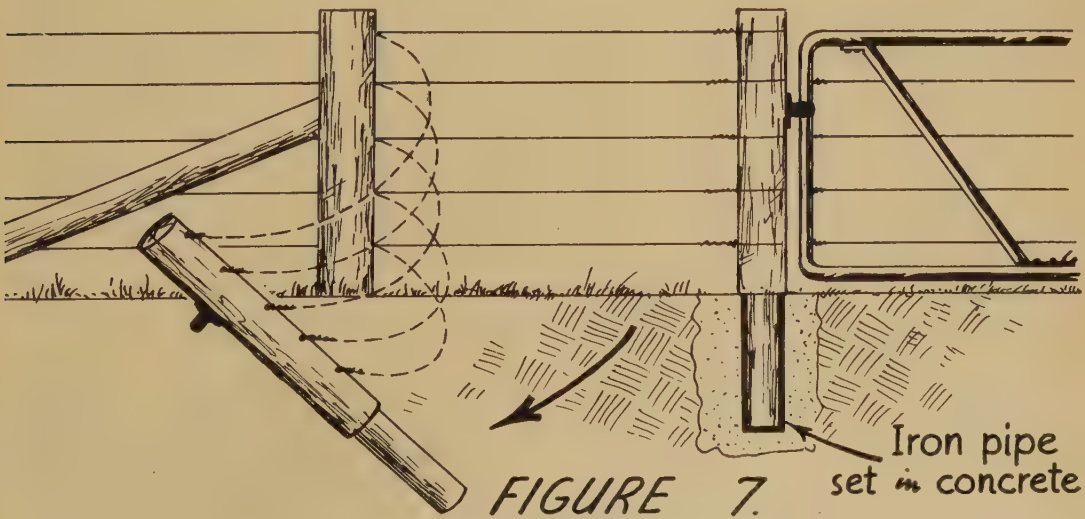
Stout droppers are used for the fence and they are bored at the normal spacings for the wires. Droppers could be spaced about 11ft. apart so that every third dropper coincides with one of the posts.

The bottom wire of the fence is run through the posts and the droppers. All the other wires are threaded through the droppers only, which are tied firmly to the wires.

The droppers which coincide with the posts are tied to the posts by tie-wires passing through the top holes of the

post and round the droppers. In periods when floods are liable to occur, the tie-wires may be loosened so that they are only lightly held by one or two twists.

Any extra pressure on the flood-proof panel allows it to fall flat but it is held in position near the posts by the bottom wire. The ends of the panel may be firmly secured to the strainer posts as, on a panel of any length, the sag of the wires and the weight of the droppers will allow the fence to drop flat over most of its length.



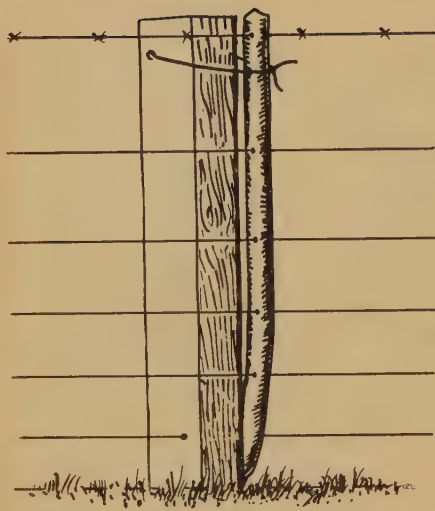
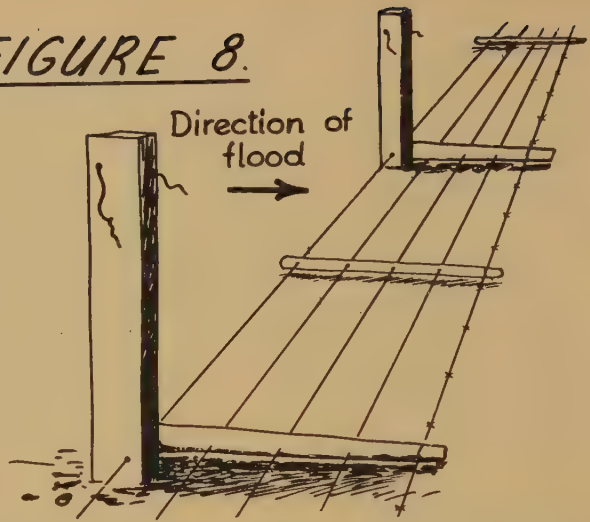


**FIGURE 8.**



## IRRIGATION EXPANSION

During last season in the irrigation areas, 1,184 acres of land have been graded, the bulk of which has gone into immediate production. This is a record for the irrigation areas as in the previous highest year 925 acres were graded.

Government power graders handled 849 acres and a further 335 acres were graded by private contractors and the farmers themselves. This must be considered a particularly fine effort when the amount of work involved before and after grading, plus seeding and watering are done in conjunction with the every day activities of a dairy-farm.

In the irrigation areas from Waroona to Dardanup the following areas were brought into use:—

|                |      |           |
|----------------|------|-----------|
| Vegetables     | .... | 47 acres  |
| Potatoes       | .... | 132 acres |
| Fodder Crops   | .... | 245 acres |
| Annual Pasture | .... | 164 acres |
| Irrigation     | .... | 423 acres |
| Fallow         | .... | 173 acres |

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1,184 acres

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The total area now sown to permanent irrigated pastures stands at 14,765 acres which is an all-time record and still another record was achieved this season when 1,261 acres were established as irrigation pasture.

The expansion of our irrigated pasture is one of the methods of securing for Western Australia not only increased whole milk supplies but a greater output of butter and cheese. The figures quoted provided evidence of a splendid achievement brought about by excellent co-operation between the Public Works Department and the farmers of the irrigation areas plus a very fine job of work done by the officers of the Irrigation Branch of the Department of Agriculture stationed in those districts.



# THE REGENERATION AND MAINTENANCE OF WIMMERA RYEGRASS PASTURES UNDER SALINE SOIL CONDITIONS

By F. L. SHIER, Assistant Superintendent of Wheat Farming

**O**VER the past ten years, Wimmera ryegrass pastures at the Salmon Gums Research Station have been improved and maintained by periodic cultivation of the soil even without applications of superphosphate. On heavy crab-hole soil affected by high salt content and unsatisfactory for wheat growing, cultivation treatments have produced remarkably uniform stands of Wimmera ryegrass as shown in the accompanying pictures. The bare patches due to salt, have been largely eliminated. If the interval between cultivations is more than three years Wimmera pastures deteriorate badly.

The Salmon Gums Research Station was established in 1926 in association with the expansion of wheat growing to the belt of mallee country in the outlying south-eastern portion of the wheatbelt of W.A. It is approximately 400 miles E.S.E. of Perth and 60 miles north of the port of Esperance.

A number of soil types encountered in the region proved difficult and unsatisfactory for wheat growing especially when combined with the rather uncertain rainfall distribution of the area. Further, one of the major soil groups of the region is a heavy, crab-hole, clay type with naturally high salinity under virgin conditions and a pronounced tendency for bare patches to develop after clearing, due to surface concentration of the salt. The soils have approximately neutral reaction in the surface layer but are alkaline in the subsoil where free lime occurs.

## ABANDONED HOLDINGS

The general experience was that the first crop on such soils was reasonably satisfactory (provided the rainfall was sufficient) and sometimes the second, but thereafter wheat yields tended to fall to unprofitable levels. As a consequence, large areas of these types

which had been cleared and fenced, and in some cases provided with water supplies, were abandoned for further agriculture.

Scattered sowings of Wimmera ryegrass in a number of instances indicated that this plant was more tolerant to the saline conditions and provided prospects for making some form of agriculture possible on the basis of sheep grazing on these partially developed areas. This idea was tried out on a number of farms including the Salmon Gums Research Station in the period 1932 to about 1938.

However, over the years the results were variable and in many cases far from satisfactory. The general experience of farmers was that while the ryegrass grew satisfactorily for a year or two after planting or "scratching in" with a small seeding of oats or wheat, thereafter the plants gradually became smaller and the population less till finally there was no worthwhile quantity of this pasture plant on the paddocks. On the other hand, odd field observations indicated a markedly beneficial effect of cultivation, with or without cropping and superphosphate, on "stalled" or deteriorated pasture.

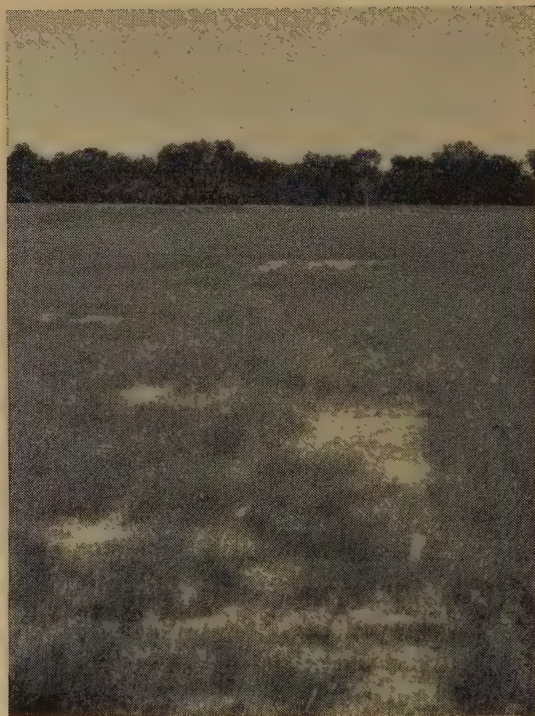


Fig. 1.—The effect of length of time between cultivation. Two views taken from opposite directions, illustrating the deterioration of fourth-year Wimmera ryegrass after a "scratched in" crop of oats. The better plot was renovated every third year (including 1950) and the oats were fed out during the winter. The photograph was taken in November, 1950.

## EXPERIMENTS

In consequence two experiments were commenced at the Research Station in 1941 to determine the effect of a number of cultural and superphosphate treatments for the regeneration of "stalled" Wimmera ryegrass pasture and on the maintenance of newly sown pasture on land typical of that under discussion. The main soil type on the experimental area is named Kumarl clay loam.

The treatments in the two experiments were as follows:—

### Regeneration of Stalled Wimmera Ryegrass

Plot 1.—Control, untreated.

Plot 2.—Scarified annually.

Plot 3.—Scarified annually and top-dressed with 1 cwt. super./acre.

Plot 4.—Scarified annually and top-dressed with 1 cwt. of superphosphate.

Burr trefoil and Barrel clover (medic to be sown 1940).

Plot 5.—Scarified and oats sown every third year (superphosphate 1 cwt./acre), commencing in 1940.

Plot 6.—Four Course Rotation. 1940 fallow, 1941 oats (superphosphate 1 cwt./acre). 1942 pasture, 1943 pasture.

Plots 7 to 12.—Replication of above.

### Maintenance of Wimmera Ryegrass

The experimental area was scarified in June, 1940, following rain and the ryegrass sown at 2 lb. per acre with 1 cwt. of superphosphate. Although the rainfall was below average a good cover of the grass was obtained.

Plot 1.—Control, untreated.

Plot 2.—Four Course Rotation. 1941 fallow, 1942 oats. 1943 pasture, 1944 pasture.



Fig. 2.—The photograph on the left shows deteriorating fourth-year Wimmera ryegrass compared with that scarified every third year including 1950. The right hand photograph shows the effect of superphosphate. Both plots were scarified annually but the lighter-coloured section on the left received 1 cwt. of superphosphate. Note also the absence of bare patches.

Plot 3.—Six Course Rotation. 1941 fallow, 1942 oats, 1943 pasture, 1944 pasture, 1945 pasture, 1946 pasture.

Plot 4.—Three Course Rotation. 1941 oats, 1942 pasture, 1943 pasture.

Plot 5.—Five Course Rotation. 1941 oats, 1942 pasture, 1943 pasture, 1944 pasture, 1945 pasture.

Plot 6.—Scarified every third year commencing 1941.

Plot 7.—Scarified and topdressed every third year commencing 1941.

Plot 8.—Topdressed every third year commencing 1941.

Plot 9.—Six Course Rotation. 1941 clean fallow, 1942 oats, 1943 Wimmera ryegrass, 1944/46 pasture.

Plots 10 to 18.—Replication of above.

This paddock had previously been cropped in 1930, 1932 and 1934 in each case following fallow with a dressing of 1 cwt. of superphosphate on each occasion. The actual yield in the first year is not definitely known but the

crop was quite a fair one and the Station average was 16.9 bushels; in 1932 and 1934 the yields were 9.7 and 4.6 bushels respectively for the wheat crop. These are typical of the general experience with such soils in the Salmon Gums area.

### VALUE OF CULTIVATION

It has not been possible to arrange for a regular accurate assessment of the yields of pasture from the different treatments but in a number of years quadrat samples have been taken from all plots. These have confirmed two important visual observations—firstly, the improvement in the pasture by cultivation and secondly, that cultivation every third year, either alone or per medium of a scratched in crop is equally effective as annual treatment, in maintaining the Wimmera pasture.

Where cultivation was only carried out every fifth year, there was a marked



Fig 3.—A "close up" showing the growth of Wimmera ryegrass on one of the cultivated plots.

Fig. 4 (below).—Two photographs taken from opposite directions, showing the poor, thin growth on the untreated control plots, in contrast to the good growth and absence of bare, salty patches on the fallow-oats-pasture (1950) plot. The photographs were taken in November, 1950.



deterioration of the pasture towards the end of the ley, with the development of bare salty patches.

Superphosphate in addition to annual cultivation has not given any marked or regular increase in pasture yield compared with the scarified annually treatment although the former tends to mature a little earlier than the latter. This absence of response to phosphate is not entirely unexpected in view of the marked residual effects on cereal yields from previous superphosphate applications demonstrated on other areas of the Station.

The main findings from the two experiments are amply demonstrated in the accompanying illustrations which were taken by Dr. T. C. Dunne in November, 1950. The whole experimental area was heavily fed off in July-August. The effect of cultivation in preventing the development of bare salty patches or encouraging the growth of pasture on such patches is self evident.

# BARREL CLOVER

## *Some Encouraging Results at Salmon Gums*

By F. L. SHIER, Assistant Superintendent of Wheat Farming

**R**ESULTS obtained with barrel clover in recent years at the Salmon Gums Research Station suggest that this legume will play an important part in improving the quality and quantity of the grazing on many farms in the district. It has shown its ability to survive and to build up from small sowings under average rainfall conditions and to produce a large bulk of feed in a wet year. By comparison Dwalganup subterranean clover has not done nearly as well.

Pasture development, with more productive species of high feed value, has become a very important problem in the Salmon Gums district in recent years. There has been a marked increase in sheep numbers, not only following the usual pattern of development in the wheat areas, but also as a result of the low and unreliable wheat yields on certain soil types.

In consequence wheat growing has been restricted to the limited areas of the more suitable soils and sheep raising has tended to become the main source of farm income. The Rural & Industries Bank instituted and encouraged a scheme of farm linkages so as to give each settler a reasonable area of the better soils and also permit him to carry a sizeable flock of sheep.

### **NATURAL PASTURES POOR**

However, both natural and volunteer pastures are poor. Virgin country provides practically no grazing, while on cleared land cropped periodically to cereals and grazed by sheep, only poor volunteer pastures exist, even after 20 years. The scanty grazing has included practically no legumes. Pasture species such as barley grass, silver grass, bromes and capeweed which quickly become self-introduced in the main wheatbelt are poor and sparse whilst the usual volunteer or so-called

"native" clovers are non-existent. On the other hand sowings of Wimmera ryegrass have been very satisfactory. This plant has now become the main grazing of the district, and where it is periodically cultivated with or without a cover crop, has appreciably raised the carrying capacity of the farms.

Under these conditions the desirability of a suitable legume for the district needs no emphasis. At the Salmon Gums Research Station many sowings have been made on several soil types of species such as burr trefoil, snail medic and cluster clover but invariably these have been failures.

### **PROMISING LEGUME**

A legume which has, however, shown distinct promise is barrel medic (*Medicago tribuloides*) or, as it is more commonly called, barrel clover. Over the last three years, field sowings on soils with a shallow sandy surface overlying a sandy clay subsoil have been most encouraging and excellent swards of this pasture have developed in the second and third year.

The first field sowing of 10 acres of barrel clover at 6lb. per acre with 20lb. of oats and 1lb. of Wimmera was made with the sunderseeder in April, 1948, following 80 points of rain. It is an area of Circle Valley sand, a soil which

is approximately neutral (pH 6.5-7.0) in the surface sand but alkaline (pH 8.0-8.5) in the subsoil. Below 12 inches, lime nodules generally occur.

The seed was inoculated with the rhizobial culture prepared by the Government Plant Pathologist and which has given excellent results with barrel clover in experiments at the Wongan Hills and Merredin Research Stations. This seed treatment is recommended for all sowings of this clover. Some seed germinated shortly after seeding but the main germination was in June.



Barrel clover (right) and Dwalganup subterranean clover (left) growing with Wimmera ryegrass at the Salmon Gums Research Station in August, 1951. The clovers were sown at 3 lb. and 6 lb. per acre respectively in May, 1949.

Despite a very dry period in spring the plants set appreciable seed. On an adjoining area Dwalganup subterranean clover grew poorly and suffered badly in the spring—little seed was set.

### FIRST CLASS GRAZING

The barrel clover was topdressed with 56lb. of superphosphate per acre in 1949, 112lb. in 1950 and 90lb. in 1951. There was almost a complete cover by Sep-

tember, 1949, with further improvement in 1950. Rainfall was about average in these two years. In the fourth year, 1951, the rainfall was considerably above average. Germination followed falls of about 5in. in January-February, and the barrel clover attained sward conditions, about six inches high, by June. Wimmera also grew prolifically and the mixed pasture provided first-class grazing for the sheep.

On a similar soil type in an adjoining paddock, a further 40 acres of this clover was sown at 3lb. per acre in 1949.

This grew very well and with good spring rains considerably more seed was produced than in the first year with the 1948 sowing. It developed to a good pasture in 1950 and in the third year, 1951, was excellent with an even mixture of Wimmera ryegrass (see illustration). It provided good grazing for stock in the winter and summer periods. As was the case with the first paddock, Dwalganup subterranean clover on an adjoining area under similar conditions to the barrel clover was relatively poor despite the good season.

Our experience with barrel clover at the Salmon Gums Research Station on the soil type described has been most encouraging. A further 100 acres will be sown this year. It is apparent that this plant is very hardy and well suited to the particular soil. Its hardness is no doubt related to its relatively deep rooted habit and, even in years when the rainfall is low in spring, it still sets some seed. Under suitable conditions it has the capacity to produce a large

bulk. Barrel clover and Wimmera ryegrass would appear to be a very promising pasture mixture in the Salmon Gums district, for sandy-surfaced soils with sandy clay subsoils. Seeding rates

of 3lb. and 1lb. per acre respectively are recommended, whilst the barrel clover should be inoculated with the rhizobial culture available from the Department.

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## AIRCRAFT TO BE USED ON AGRICULTURAL ADVISORY WORK

**F**OR the first time in Western Australia, an aircraft will shortly be used as an adjunct to the Department of Agriculture's advisory services.

Mr. J. R. M. Wolfe, an advisor on the staff of the Department of Agriculture's North-West Branch, recently took delivery of a canopied Tiger Moth aircraft which he will use for travelling between stations in the Port Hedland district. Mr. Wolfe is a graduate of the University of Western Australia and obtained his pilot's license through the Royal Aero Club of W.A. He has been with the North-West Branch for two years, engaged in studies of sheep fertility, mineral deficiencies and related subjects in the spinifex areas. He recently disposed of the utility truck which was his former means of transport and is taking to the air.

Mr. Wolfe feels that much time can

be saved by air travel and cited instances of journeys which were only 60 miles by air but would necessitate travelling 360 miles by road to travel between the same two points. His headquarters are at Mundabullangana Station about 50 miles south-east of Port Hedlands.

Apart from widening the scope of his advisory work by the use of an aircraft, Mr. Wolfe feels that he will be able to render service to pastoralists by assisting in "spotting" mobs of sheep at mustering time. Several North-West pastoralists now have their own aircraft which are a valuable aid to station management in these days of labour shortages. Mobs of sheep may be spotted from the air and their position indicated to the mustering crews by means of marked diagrams dropped near the camps.

## FARMERS

This is **YOUR** Journal, and it has been written, edited and presented in a sincere endeavour to give you helpful information in an interesting manner.

We would like to have your views on the Journal—to know whether you like it or whether you don't. Drop a line to the editor and tell him the features you like and don't like in this issue—or the features you hope to see in future issues.

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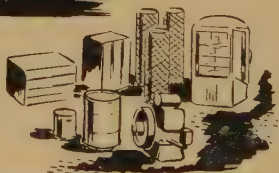


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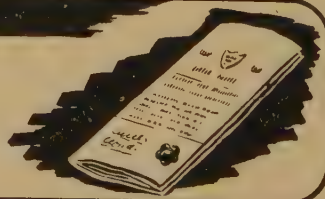


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# PEDIGREE SEED

## *Wheat, Oats and Barley*

**S**UPPLIES of pedigree seed wheat, oats and barley will be available for distribution from the forthcoming harvest at the Department's Research Stations. The seed will be available on a cash basis only. Varieties available this season are listed below.

### WHEAT

#### Midseason.

Baroota Wonder (Hay Variety).

Bencubbin.

\*Bencubbin 48 (Rust resistant).

Eureka (Rust resistant).

Kondut.

Yalta (Rust resistant).

#### Early.

Dowerin (Rust resistant).

Gabo (Rust resistant).

Koorda.

Wongoondy (Rust resistant).

#### Very Early.

Bungulla.

### OATS

#### Late.

Algerian.

#### Midseason.

Dale.

Guyra.

Fulghum.

#### Early.

Ballidu.

#### Very Early.

Wongan.

### BARLEY

Atlas 6-row.

Prior 2-row.

Maltworthy 2-row.

\* A limited quantity only will be available.

Cash prices per bag of three bushels, inclusive of rail freight to farmer's siding will be:—Wheat, 55s.; Barley, 55s.; Oats, 45s.

The aim of the policy adopted with the distribution of pedigree cereal seed is to provide as many farmers as possible with a few bags of the varieties grown by them and which are available from the Research Stations. The maintaining of "stud plots" by farmers is of major importance in the maintenance of the purity of their seed plots and the small quantities of seed obtained by them are sufficient to establish such plots. Each bag of wheat will sow at least four acres and each bag of oats or barley three acres.

In order to avoid disappointment in obtaining their requirements, farmers would assist considerably by noting the following directions:—

- (1) All applications should be made direct to the Department of Agriculture, Perth.
- (2) Applications should include full name and postal address and also the siding to which it is desired the seed to be railed.
- (3) Early application.
- (4) As soon as possible after receipt of account, cash remittance should be forwarded. Statements of account are sent out in order of receipt of the applications. No definite reservations can be made until after receipt of the necessary cash remittance.

The following are short descriptions of the recommended varieties which are at present being produced as pedigree seed—

## WHEAT VARIETIES

### Midseason Maturing

*Hay Variety — Baroota Wonder* — This variety is grown almost exclusively for hay. It is relatively tall growing and remains green to the base until haycutting time. It is very susceptible to loose smut and rust, but moderately resistant to flag smut.

*Kondut*—Bred at the Wongan Hills Research Station, Kondut has yielded well over a wide range of soil and climatic conditions. Although not rust resistant, it gives better yields under epidemic conditions than Bencubbin. It is resistant to flag smut. The straw is stout and the variety can be recommended for early planting, particularly on light and clover-ley land. Kondut yields flour which is usually superior in strength to that of the f.a.q.

*Eureka*—This variety was bred in New South Wales and is a stout strawed, rather tall growing, brown chaffed variety with translucent grain. The flour strength is good: it is resistant to flag smut and to the rust races prevalent in this State. The desirable planting date for Eureka in each district would be about the same as for Bencubbin.

*Bencubbin*—The standard midseason wheat. The straw strength tends to be weak on light land but is satisfactory for hay. Bencubbin is notable for its high yields under inferior seasonal conditions and although very susceptible to rust, is resistant to flag smut. The flour strength is equal to the State f.a.q.

*Bencubbin 48*—A strain of Bencubbin produced at the Waite Institute in South Australia. It was evolved by crossing Gabo with Bencubbin, then backcrossing to Bencubbin until a variety was produced similar to the parent variety Bencubbin, except that it possesses rust resistance and semi-translucent grain. In other characters, including yield, maturity, straw strength and grain quality, it is identical with Bencubbin.

*Yalta*—A midseason maturing variety bred by the New South Wales Department of Agriculture, resistant to all races of stem rust known in Western Australia. It stands well and has good quality grain. Highly resistant to flag smut.

### Early Maturing.

*Dowerin*—This variety was produced at the Merredin Research Station. It is of early to midseason maturity, tall growing with straw which shows a tendency to weakness under certain conditions. The grain, of

good quality, is held well, although threshing is inclined to be somewhat tough. It possesses very good resistance to all known races of stem rust in Australia. In addition it is resistant to flag smut.

*Gabo*—A wheat bred at Sydney University, it is resistant to stem and leaf rust in Western Australia but susceptible to flag smut. Possessing short strong straw with small grain of good milling quality, it has the ability to yield well.

*Koorda*—Bred at the Merredin Research Station, it has yielded well on the lighter soils where its strong straw is of great value. Koorda is practically immune to flag smut and tends to be rust escaping in all but the heaviest epidemics. The flour strength is about the same as that of the f.a.q. standard.

*Wongoondy*—Bred at the Merredin Research Station from a cross between Eureka and Bungulla, it possesses straw of good strength and is resistant to the types of rust at present prevalent in Western Australia. Its yield is satisfactory and flour strength approaches that of premium varieties. The variety is also highly resistant to flag smut.

### Very Early Maturing.

*Bungulla*—The standard early maturing variety and a selection from Bencubbin. Like Bencubbin, it is notable for its high yields particularly under low rainfall conditions. Because of its early maturity, it usually suffers relatively little rust damage. The straw strength is satisfactory on the heavier soil types. Bungulla is satisfactory for hay, whilst the flour strength is equal to the f.a.q. of the State. It is resistant to flag smut but not to rust.

## OAT VARIETIES

### Late Maturing.

*Algerian*—The standard late general purpose oat which is cultivated chiefly in the Great Southern areas of the wheatbelt and the higher rainfall districts of the State. It is also used extensively for oatmeal manufacture.

### Midseason Maturing.

*Guyra*—The standard midseason variety which is notable chiefly for its plump grain. Guyra is an indifferent variety for grazing and recovery since the early growth is relatively sparse and the grain yields, subsequent to grazing, only fair.

*Fulghum*—The standard grazing and recovery oat, it can be grazed later in the season than other midseason varieties, but is not a good general purpose oat as the straw strength is very poor. The grain is suitable for oatmeal manufacture.

**Dale**—This has given satisfactory results as a general purpose variety under a wide range of conditions. It is markedly superior to other midseason varieties in respect to straw strength and is very suitable for early grazing.

### Early Maturing.

**Ballidu**—The standard early oat. The straw strength and grain yields are outstanding, whilst its vigorous leafy early growth and satisfactory recovery make it suitable for grazing and recovery. It is now the most widely grown oat variety in Western Australia.

### Very Early Maturing.

**Wongan**—The standard very early maturing oat which is notable for its vigorous early growth and strong straw. It is satisfactory as a hay variety, it stands well, but tends to shed if left unharvested too long after it has matured. The vigorous early growth makes Wongan a suitable variety for early winter feed, but it cannot be grazed as late in the season as Ballidu and the midseason varieties if recovery for grain is desired.

## BARLEY VARIETIES

**Atlas**—A six-row malting type, also known as Californian 6-row. It is grown as a malting barley for the export trade, and is also eminently suitable for early green feed and feed grain purposes, being superior in yielding capacity to Cape. The results of trials with this barley indicates that it is generally superior to oats as a source of early green feed.

**Prior**—A two-row barley which is the most important malting variety grown in the Commonwealth. Although early maturing, for satisfactory malting grain it should not be grown in the drier areas of the wheat-belt.

**Maltworthy**—Bred at the Roseworthy Agricultural College, South Australia, it is a 2-row early to midseason maturing variety, strong strawed and superior to Prior in its resistance to strong winds when no occurrence of "necking" is evident. Maltworthy possesses excellent yielding ability. It matures a few days later than Prior and for satisfactory malting grain it should not be sown in areas with an annual rainfall below 17 inches.



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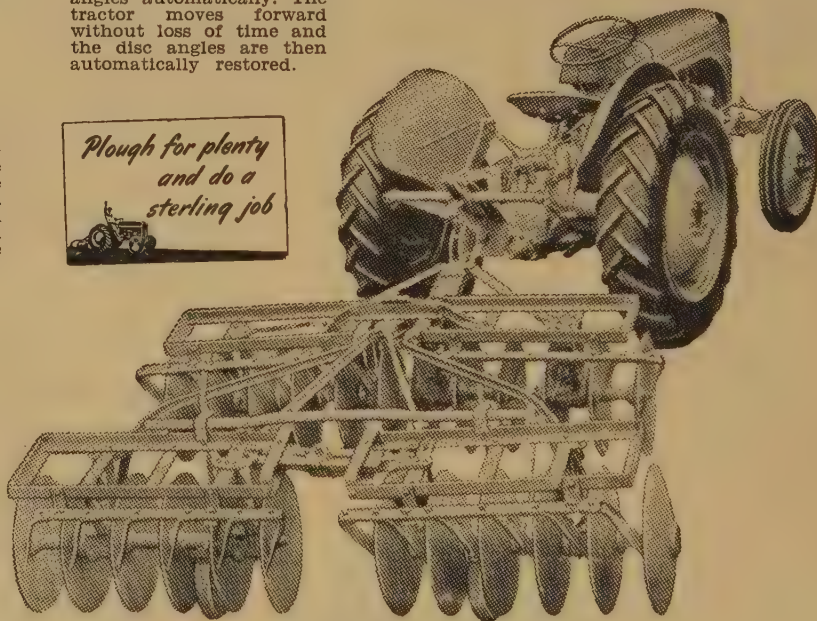
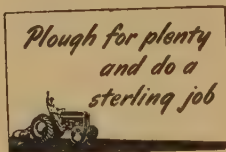
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# THE SOIL ... OUR BASIC ASSET



## WATER EROSION CONTROL—5

### *Contour Working Increases Effective Rainfall*

By B. a'B. MARSH, B.Sc. (Agric.), Adviser, Soil Conservation Service

**C**ONTOUR working holds rainwater where it falls; as a result erosion is reduced, and the effectiveness of rainfall is increased. Contour working is the working of the land in such a way that a large proportion of the furrows are fairly close to the contour. In short, furrows are level and will hold water.

Erosion by water occurs when water runs over the surface or when raindrops pound bare soil and splash it downhill. Raindrop splash can carry soil downhill even when there is **no water running over the surface**. (For more detail see March-April issue, p. 250.) Contour working will reduce erosion caused by run-off but will not stop erosion caused by splash effect; only plant cover will do this. It is necessary to help contour working with improved farm and pasture management.

As water is held where it falls, dry ridges benefit and water is kept out of

low-lying wet patches. Crops benefit from the increased moisture available. Where the rainfall is less than about 18 inches per annum, contour working can be used to improve the moisture distribution. Where rainfall is more than 20 inches don't use contour working unless cropping is fairly infrequent; there is too much risk of furrows overflowing.

As the effect depends on the capacity of the working furrows, contour working is not effective on steep slopes and it is suggested that it be limited to slopes less than about 8% (8 feet in 100

This is the sixth article of a series which commenced in the January-February issue of the Journal—a series which outlines the principles of soil conservation and their main applications in Western Australia. It is hoped that the articles will help to impress upon farmers the need to conserve the soil and prevent erosion, and will point the way to the practical application of suitable soil conservation techniques.

The Soil Conservation Service exists to co-operate with farmers to this end. If you would like an officer of the Service to visit your property to discuss your soil conservation problems, write without delay to the Commissioner of Soil Conservation, Department of Agriculture, Perth.

There are very many small eroded areas which farmers can reclaim, or protect from further damage, with their present equipment.

Soil Conservation Schools lasting one day will be conducted for groups of farmers to show how they can do this work themselves. A district organisation can arrange this for a group as small as six or up to sixty or seventy.

feet). Harrows reduce the furrow capacity and should not be used.

To help you to understand what is involved in contour working, it may be best to describe a paddock as shown in the diagram (Fig. 1). The paddock which slopes to the west is not eroded except for one gully. To stop the gully eroding further, it is filled and equipped with short spreader banks. The rest of the paddock is marked for contour working. The guide lines are marked with one round of a disc plough or similar implement to make a small ridge which will last for a few years. These lines are level.

Lines 1 and 2 are surveyed from either corner of the timber so that there are not too many sharp corners.

Lines 3 and 4 are surveyed four to five chains apart on the fence line.

Line 5 is further than 5 chains from Line 4 because it is surveyed from the new gate. This line is then used as a farm track. The south end of the line is continued off the contour (shown as dotted line) so that it meets the timber in a suitable place. The old track is abandoned and the gate is moved

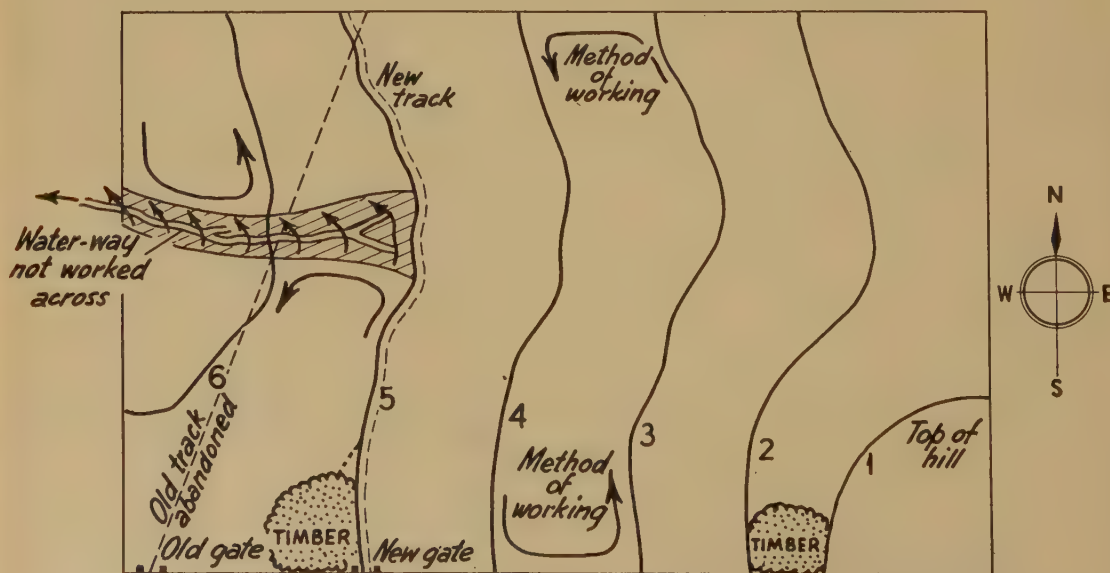


Fig. 1.— A diagram showing a 90-acre paddock marked for contour working.  
(See text for detailed explanation.)

uphill to the end of the new track. The lands are worked between the lines and from fence to fence except below Line 5, where the gully divides the land into two. The gully, though filled, will still receive some water and must not be crossed while cultivating. Finishing off furrows are close to the level.

Working is carried out round and round between the lines and, except for the ends of the lands, the working is on the level; bogging in loose or wet soil is greatly reduced and fuel savings of up to 10% have been reported.

As the working at the ends of the lands is up and down hill, the concentration of water down long furrows is avoided by close spacing of the guide lines. It is wise to avoid working out the corners.

Contour working alone is not adequate where many gullies (filled or unfilled) are present or where the paddock has more than one steep sided or well defined depression. Soil should not be cultivated where any appreciable quantities of water may run. **Where contour working is not safe it is fairly certain that the existing method of working (round the paddock) is also not suitable.**

If time and economics allowed, all such areas, to be safe, should be treated with contour banks or furrows. Where time or economics do not allow this, it is perhaps wise in many cases to consider taking some risks in using contour working.

Contour working guide lines are easily and quickly surveyed and large areas can be covered in a short time. Large areas should be treated in this way. Soil Conservation Officers do



Fig. 2.—Contour-worked combine furrows, photographed after rain, showing the water-holding capacity.

carry out this type of work, but to have large areas treated it is necessary to teach farmers to do their own work.

**Soil Conservation Schools** are now conducted to teach farmers some of the principles of Soil Conservation, and to teach them how to attack their problems and how to design and survey their own layouts.

## FREE SERVICE TO FARMERS

Do you know that the Department of Agriculture provides a free and comprehensive service of advice and technical assistance to farmers.

The Department of Agriculture is at all times ready to assist you with your farming problems and has a number of informative bulletins available covering most phases of agriculture. These are supplied free of charge on application to the Department of Agriculture, St. George's Terrace, Perth.

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Drop a line to the Department whenever you are in need of advice.



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# SOIL CONSERVATION SERVICE

## *Basis of Co-operation with, and Assistance to Farmers and Landholders*

By G. H. BURVILL, M.Ag.Sc., Commissioner of Soil Conservation

**T**HE Soil Conservation Service has been established as provided in the Soil Conservation Act, 1945. To carry out its objectives will require the co-operation with it of individual farmers and landholders. The policy of the Service is therefore to encourage farmers to help themselves, and particularly to encourage them to recognise the need for soil conservation methods and for soil erosion control in the early stages. More particularly, the Service aims to provide, through its trained staff, technical assistance in the way of agricultural advice, research, conservation, planning, layouts and surveys. As indicated below, under the heading "Charges for Soil Conservation Work," all of the activities of the Service are provided free to landholders except for certain surveys and supervision.

Many soil erosion and soil conservation problems can be remedied by changes in farm practices. In other cases measures such as contour furrows and surveying, are needed to support changes in cropping and grazing methods. After the farmer and soil conservationist agree on a plan it becomes the obligation of the farmer to do, or arrange for, the necessary surveys and the construction work. Advice on suitable machines and methods will be given by Service officers. Of course, any soil conservation plan can only be fully effective if the farmer adheres to any agreed changes in his farming practices and also sees that all earth works, especially contour banks and waterways and other structures, are kept in good condition.

### **CHARGES FOR SOIL CONSERVATION WORK**

As indicated above, advice with respect to soil erosion and soil conservation matters is provided free of charge, but the farmer must accept certain obligations with respect to surveys and construction work. As a clear basis for

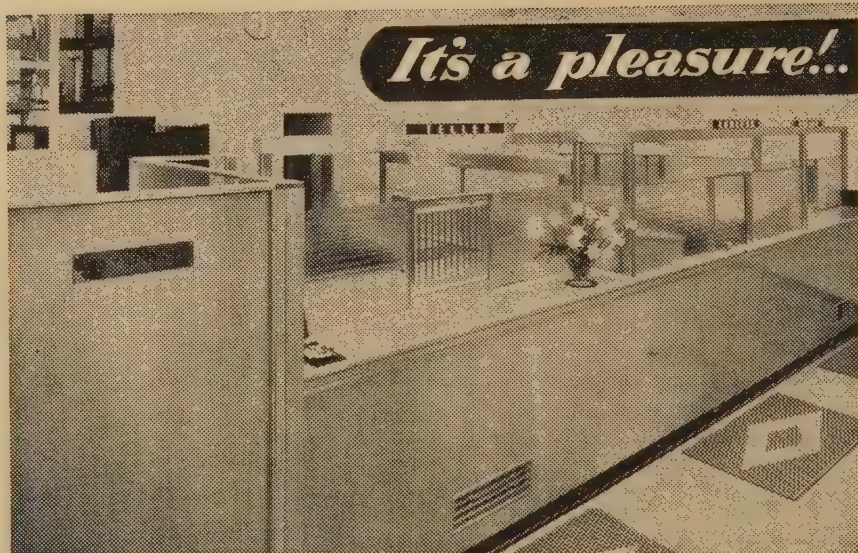
distinction between free and chargeable services the following sets out the position.

#### **(1) Advice—Free.**

- (a) This will include general discussion of soil erosion and soil conservation with the farmer and inspection and discussion of his special problem to outline any necessary course of action.
- (b) It may include supervision or instruction of a farmer and his employees in the operation of any surveying equipment or plant which a farmer may wish to use in carrying out recommended practices, but shall not be extended to cover the whole of the work. If convenient, it may include a subsequent inspection of the work while in progress, or after completion.

#### **(2) Surveying.**

- (a) This work is chargeable where it involves the surveying of lines for contour pasture furrows, contour banks, diversion



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banks, etc., by a Soil Conservation Service officer or officers. If one officer is involved and the farmer supplies other help required the charge is £1 per hour. Where two officers are involved at the same time £1 10s. per hour.

(b) In assessing chargeable time—

- (i) Time travelling to and from the property shall not be included.
- (ii) Time on the property to carry out pre-arranged survey work shall commence from the time of arrival and continue while the survey is progressing, except for normal meal hours or unfavourable weather conditions.
- (iii) During the surveying, time spent waiting for the survey lines to be marked, or in collecting pegs and

shifting about the paddocks, shall be chargeable.

- (iv) Time spent in supervision of work for farmers beyond that defined above in (1) (b) shall be chargeable at the rate specified in (2) (a).
- (v) Time shall be calculated to the nearest half hour.
- (vi) There shall be a minimum charge equivalent to two hours work.

### (3) Experiments and Demonstrations and Farmers' Schools.

In certain cases work may be undertaken by Service officers on private property, and may be regarded as for purposes of experiment or demonstration, or for the purpose of conducting a farmers' school in soil conservation practices. In such cases as may be mutually agreed between the landholder and the Commissioner of Soil Conservation, some or all of the work may be exempt from charges.

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# CHECKING RUN-OFF ON CULTIVATION

## *Perenjori Farmer's Novel Experiment*

**M**ANY people passing Mr. S. C. Leonard's property in the Perenjori district have been puzzled by the unusual patterns left on his cultivated paddocks (see right-hand photograph). They are the result of an interesting experiment to check run-off.

Noticing that after heavy rains, the furrows normally left by a cultivator were liable to become water-channels on sloping land, Mr. Leonard sought some method of checking this tendency.

Among various anti-erosion measures evolved to combat "dust bowl" conditions in the U.S.A. was a specially-designed plough which instead of making continuous furrows made short lengths with bars of unturned soil separating them. This gave the ploughing a "honeycomb" appearance, with thousands of short troughs which held the water until it was absorbed where it fell.

### SCRAPHEAP MATERIAL

Having seen photographs of land treated in this manner, Mr. Leonard decided to experiment in the direction of the breaking up of the normal cultivator furrows. From the farm scrap-pile he obtained three sections of spiral beaters from an old sunshine harvester, together with two lengths of beater spindle and two small belt-pulleys.

He welded the spindles to give a bar of sufficient length to carry the beater sections with about nine inches protruding at each end. The beaters were fixed on the spindle with the usual set-screws and the belt-pulleys with collar



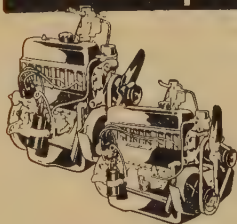
Old harvester beaters revolving on a spindle used to break up the furrow pattern left by a spring-tyne cultivator.

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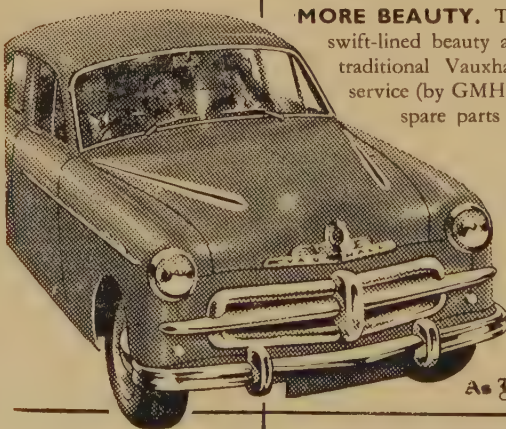
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washers at each side to hold them in place were placed on the protruding portions of spindle to act as bearings. The set-screws, which normally hold the belt-pulleys in position, were removed and replaced by grease nipples.

A trimmed gimlet sapling was suspended across the rear of the cultivator by two lengths of chain.

Two old harvester wheel spokes had the riveted ends turned over to make eyes and these were attached by a few links of chain to the rims of the belt pulleys. The threaded ends of the

spokes were inserted in holes bored in the gimlet bar and held there by nuts and washers at each side of the bar to give a fairly rigid coupling (see left-hand photograph).

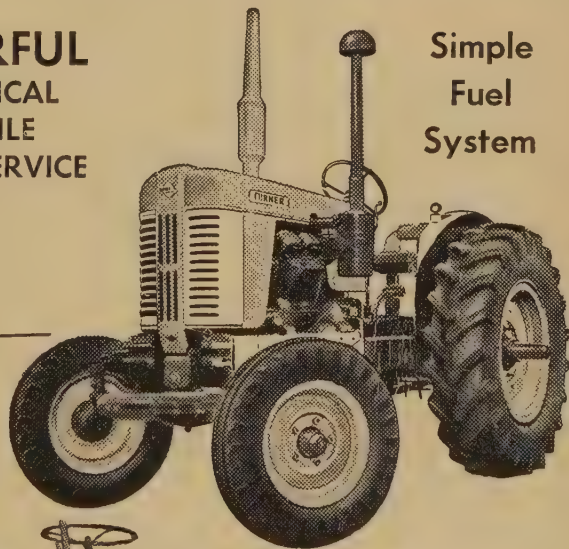
The beaters and spindle rotate in the pulleys as the cultivator moves along, and the ridges and furrows left by the tyres are interrupted to give the waffle-like pattern shown in the photograph. Even in this primitive form, the device has proved quite successful in checking run-off but a similar idea incorporating wider and heavier blades would give still better results.



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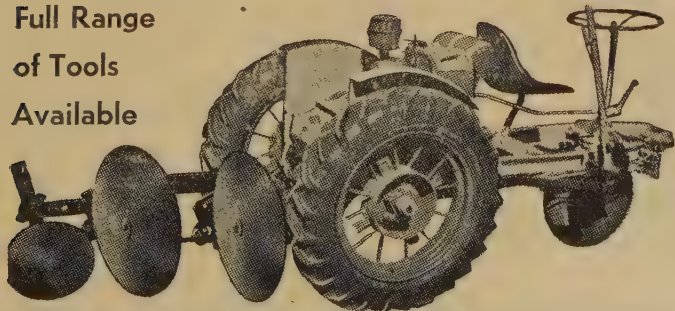


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# TREES OF WESTERN AUSTRALIA

By C. A. GARDNER, Government Botanist

## Nos. 10 and 11—THE SWAMP, or FLAT-TOPPED YATE (*Eucalyptus occidentalis* Endl.) and THE BROWN MALLET (*Eucalyptus astringens* Maiden)

**T**HE two trees described hereunder may be readily distinguished when growing as they differ considerably in their barks and general appearance and grow under different conditions, but in common with some other trees of the South-West each has the mallee form, and the mallee forms are very difficult to distinguish.

The reader who has so far followed this series is probably aware of the fact that *Eucalyptus* species, like all other flowering plants are identified not by their field characteristics of habit, bark and foliage, but mainly by their buds, flowers and fruits. It is by these characteristics that their status as species and their relationship to other species are determined.

A glance at the accompanying plate will illustrate how close these relationships really are. People acquainted with the two trees can never confuse them, but when one has to rely on the usual specimens consisting of leaves, buds, flowers and fruits, the two are very difficult to separate especially in the case of the mallee or shrubby forms.

### THE SWAMP or FLAT-TOPPED YATE (*Eucalyptus occidentalis* Endl.)

The swamp or flat-topped yate is a tree attaining a height of about 70ft. with a trunk up to 20in. in diameter and a rough flaky-fibrous bark covering the whole of the trunk and the lower parts of the main branches. The branches have a smooth yellowish-grey bark, and

usually spread widely giving the crown of the tree a typically broad and flat appearance, hence the name of "flat-topped" yate.

The rough bark where it meets the smooth bark is frequently ribbony and adheres in rough-looking masses, while the trunk itself has a thick, persistent dark grey, rough, fissured bark, and the trunk is usually thickened or almost buttressed at the base. The timber is pale in colour, hard, and somewhat straight-grained, somewhat like that of yate but inferior to it in strength and durability.

Travelling southward along the Great Southern Railway, one first encounters this tree in the Wagin and Dumbleyung districts, growing on alluvial flats which are subject to flooding—as for example the margins of the Wagin and Dumbleyung lakes. From there southward the tree is common in such situations especially around Katanning and Cranbrook.

From the latter locality, it extends almost to the south coast and eastward to Esperance and beyond. It is usually associated with wet depressions or clay



A to H—FLAT-TOPPED YATE (*E. occidentalis* Endl.). A—Branchlet with leaves, buds and fruits; B—Bud in the opening stage; C—Section of bud showing the erect filaments; D—Anthers; E—Fruit; F—Longitudinal section of fruit; G—Seeds; H—Cotyledons.  
 I to M—BROWN MALLET (*E. astringens* Maiden). I—Branchlet showing leaves, buds and fruits; K—Fruit; L—Section of fruit; M—Seeds.

Wagin.

Icon. origin.

flats with a characteristically sparse undergrowth of low shrubs and cushion-like or mat-like plants. The flat-topped yate soils are "cold" soils in which the annual plants germinate late in the season, but dry out earlier than in the lighter soils. Around and to the north of Esperance the tree may be found in sandy soils close to swamps and depressions.

While this soil condition remains fairly constant there is one notable exception which is interesting. At Jarra-mongup on the Gairdner River the tree is found on the high undulating country.

The late Mr. E. A. Hassell who owned, and for many years lived at Jarra-mongup, told me that the name "Jarra-mongup" was a corruption of the native "Yarramoitch", which means "Moitch standing up", or "Moitch on high ground". The natives had noticed this peculiarity in the tree, which here occurred on granitic country practically devoid of shrubs and carrying excellent natural pasture of wallaby and other grasses. Jarra-mongup was a place famous for game. "Moitch" was the native name of the tree, and it would be well if this name were restored in place of "Flat-topped yate". According to the same authority, "Poot" was the local name for the red morrell, and "Moe" the name for the flooded gum.

Apart from a limited value as a source of timber, the tree is of little importance. Owing to the confusion between brown mallet and flat-topped yate, the figures available concerning its essential oils must be disregarded, and the bark, in marked contrast to that of the brown mallet, is very low in tannins. On the other hand it is a tree which flowers profusely, and probably would be of interest to beekeepers on this account.

The specific name, *occidentalis*, meaning "western", given by the botanist Endlicher (who did not see the living tree) is of no significance. The vernacular name of flat-topped yate is used in reference to its flat-topped

appearance when contrasted with that of the yate tree (*E. cornuta*) which it somewhat resembles, but from which it can be superficially distinguished by its smooth branches. The appellation "swamp", not quite so apt, is used because of its typical environment.

## BOTANICAL DESCRIPTION

A tree attaining a height of 50-60 feet, or a shrub, often flowering when very young; bark rough on the trunk, dark grey, fissured, the branches smooth. Leaves alternate, stalked, spreading, the leaf-stalks up to one inch in length, the blade lance-shaped, somewhat curved, 4-7 inches long, leathery, shining, oil-dotted, the midrib conspicuous, the lateral nerves diverging from the midrib at an acute angle, the intramarginal nerve distant from the margin.

Umbels axillary, 3-7 flowered, the peduncle flattened upwards or at least compressed, sometimes rather broad, 1-2 inches long, spreading or recurved. Pedicels nearly half an inch long, slender, gradually thickened upwards into the calyx-tube. Calyx-tube bell-shaped, less than an inch long (7-9 mm.), the rim expanded when in flower.

Operculum cylindrical, rather acute, usually somewhat dilated at the base, half to threequarters of an inch long. Stamens numerous, the filaments erect in the bud (not kinked), white, the anthers narrow and opening in parallel longitudinal slits.

Fruit bell-shaped, smooth, from above half an inch to nearly an inch long, the rim prominent and flat, the capsule slightly sunk, with usually four strong broad acutely pointed valves with slightly spreading tips. Fertile seeds pale brown, small, variously shaped with thin margins. Seed-leaves Y-shaped.

## THE BROWN MALLET

(*Eucalyptus astringens* Maiden)

The brown mallet (*Eucalyptus astringens* Maiden) was formerly known as *E. occidentalis* var. *astringens*. This tree is valuable because of the high tannin content of its bark. Although now rarely seen in a fully developed condition in the field, the tree attains a height of 50 feet with a trunk up to two feet or more in diameter, and erect branches. The bark is smooth and brown or grey (usually both colours are present) but with small flakes of unshed bark usually adhering in small patches, especially near the base. The bark is thin, usually with kino vessels running longitudinally through it, somewhat "gummy", and during the winter and spring weather is easily stripped. It is astringent to the taste and rich in tannins. The specific epithet *astringens* refers to this bark. The timber is pale brown, very strong and straight-grained and somewhat like that of the gimlet tree. Young trees have a dense bushy crown, but trees

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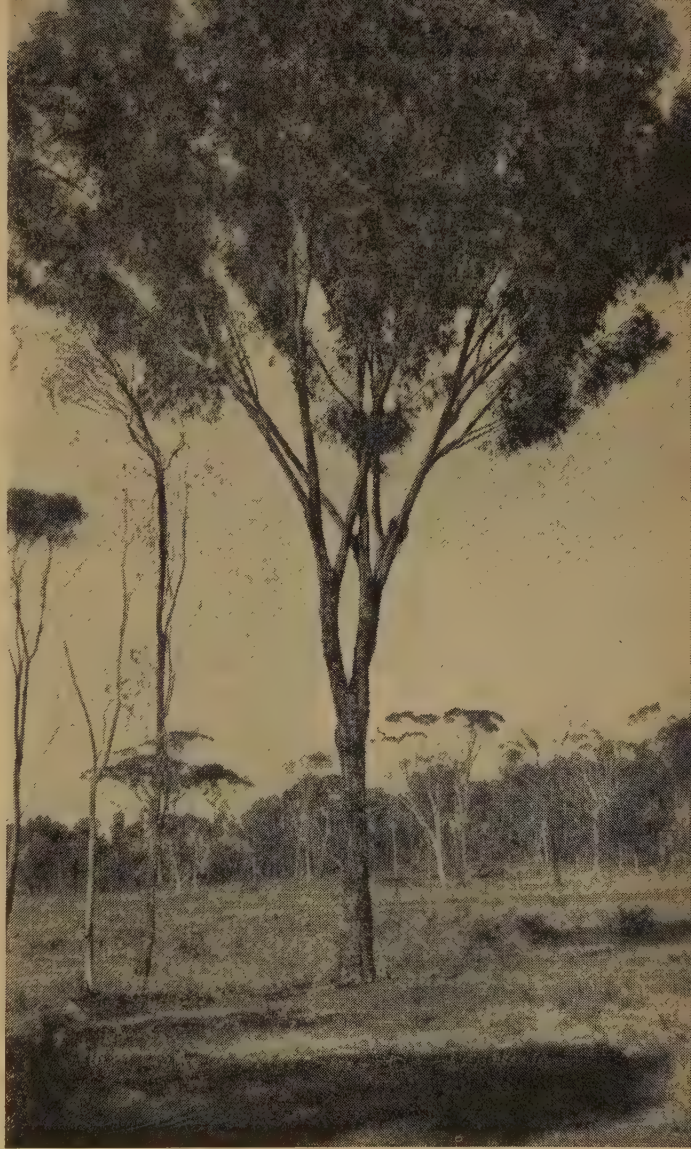
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in the woodland formation become sparsely foliaged with age.

The brown mallet occurs typically on lateritic soil, usually on hills, its range extending from near Brookton southwards to Peringillup near Cranbrook, thence eastwards to Gnowangerup and Ravensthorpe to near Hopetoun. In the northern part of its range, that is as far south as Highbury, it is found on the ironstone hills only, but to the south it is found also on the level clay soils. Between Brookton and Wagin its presence usually indicates poison country, several toxic plants being found in association with the thickets of the trees, but this is not so to the south. Its eastern limits have not been accurately defined, but the tree remains fairly common on gravelly soils near Quairading and Bendering, and small areas are found in the Ravensthorpe Hills.

It is mainly in the eastern areas that the mallee forms of the brown mallet and the flat-topped yate are found, and these can be separated only by the comparative breadth of the leaves, the somewhat longer operculum of *E. occidentalis* together with large fruits and broader stronger valves, those of *E. astringens* being smaller, somewhat rounded at the orifice, and the valves slender. The plate illustrates these small differences.

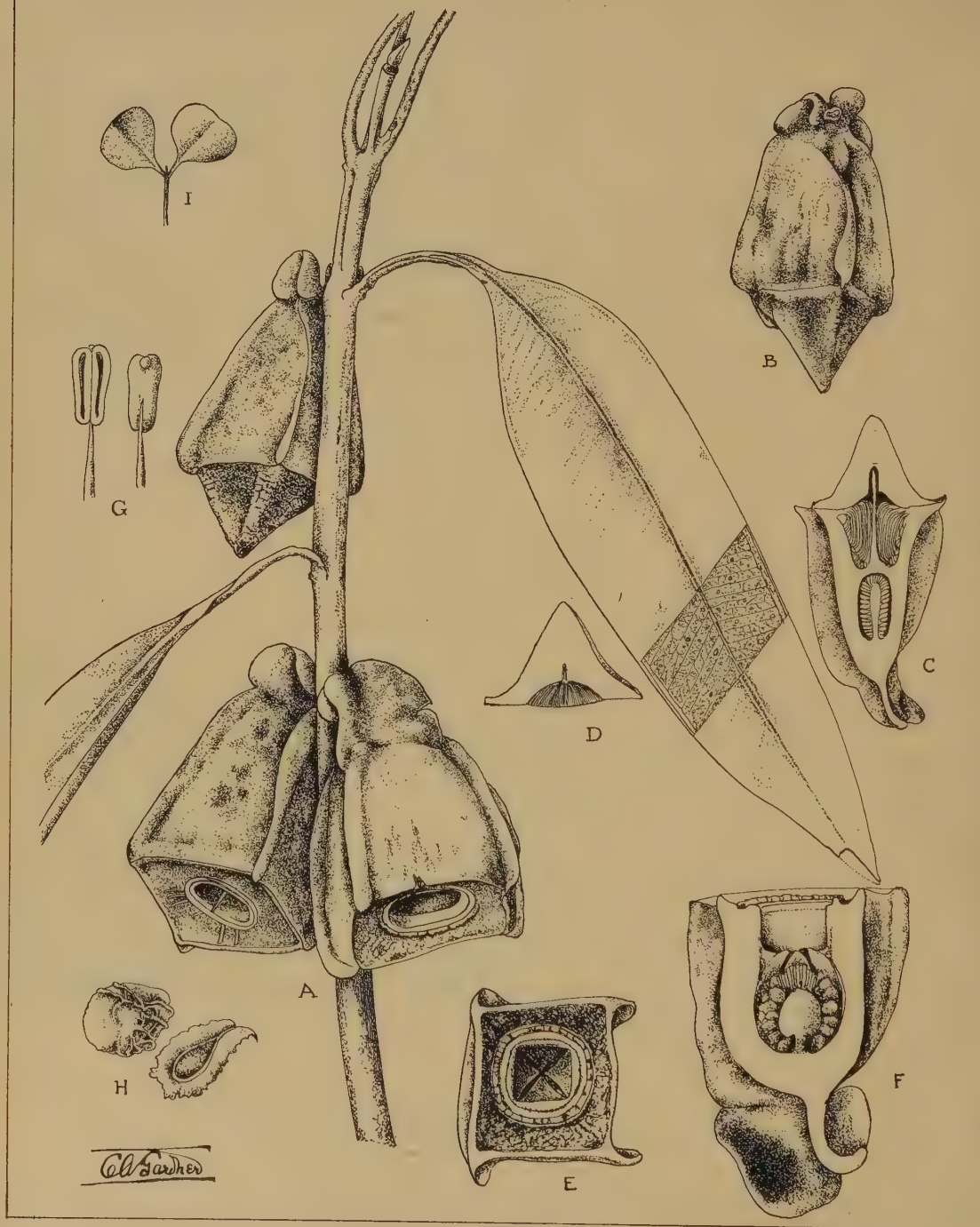
The brown mallet is valued for its bark, and is cultivated. The Forests Department maintains plantations of the tree in several areas. The bark is stripped at certain times of the year when, because of its moisture content, it strips easily: in the summer it cannot be so stripped. The tannin con-



The Brown Mallet.

tent varies from 40 to 57 per cent. The tree like the gimlet very rarely suckers, but propagates freely from seeds.

Apart from the mallees there are three trees which might be confused, having somewhat similar buds and fruits: the brown mallet has erect branches and a smooth bark throughout, and grows in high situations; the



THE FOUR-WINGED MALLEE  
(*Eucalyptus tetraptera* Turcz.)

A—Branch with leaves, buds and fruit; B—Flower bud; C—Section of flower-bud; D—Operculum in longitudinal section; E—Apical view of ripe fruit; F—Section of the fruit; G—Anthers; H—Seeds; I—Cotyledons.

Perth, W.A.

swamp or flat-topped yate has a rough bark on the trunk and smooth branches of a pale colour, and occurs in low-lying situations not far removed from fresh water during the winter months. *Eucalyptus Sargentii* is the salt gum, which grows near Wyola and Cunderdin, and again near Hine's Hill, and Lake Mears. It has a rough-barked, usually short trunk, the bark being almost black and very curly, and the branches are smooth and reddish. This tree grows in saline soils, and is usually the last tree to perish when land becomes salt. In this respect it has a value in its salt tolerance. The blue mallet (*E. Gardneri*) should not be confused with the brown mallet, differing in its blue-grey leaves and narrow

acutely-pointed bud cap, with fruits not unlike those of the Wandoo.

## BOTANICAL DESCRIPTION OF BROWN MALLET

Tree 30-45 feet tall, with a straight trunk and erect branches, the bark smooth, reddish-brown and grey, sometimes with persistent patches of curly crimped bark adhering in spots, the trunk cylindrical or rather angular. Timber pale brown, straight-grained, strong. Branchlets angular. Leaves alternate, stalked, erect, leathery, lance-shaped, the same colour on both surfaces, somewhat shining, the veins not very prominent, and usually finer and less spreading than in *E. occidentalis*, acute, the midrib prominent. Oil dots fairly numerous, the leaf 4-6 inches long.

Umbels 3-7 flowered, the peduncles at first erect, later spreading or recurved, terete or angular. Calyx-tube bell-shaped, about one-third of an inch long, smooth. Operculum cylindrical, from as long as to half as long again as the calyx-tube, usually blunt. Stamens as in *E. occidentalis*. Frut bell-shaped, rarely half an inch long, the rim raised above the ovary, but more or less rounded and not expanded as in *E. occidentalis*, the valves fine and much less exerted than in *E. occidentalis*. Seed-leaves Y-shaped.

## No. 12—THE FOUR-WINGED MALLEE (*Eucalyptus tetraptera* Turcz.)

**T**HIS small shrub was first discovered by James Drummond in 1847 between Cape Riche and Doubtful Island Bay, and was named by the Russian botanist Turczaninow from the four-winged buds and fruits. It is now fairly common in cultivation, being attractive when in bud and in flower, and always curious because of its large square fruits and large, very thick, bright green leaves, which are the thickest of any species of *Eucalyptus*. The plant is deserving of a place in any garden, and will thrive in poor sandy soils.

*Eucalyptus tetraptera* is confined to a stretch of country extending from the Stirling Range eastwards to Israelite Bay to the east of Esperance. It rarely exceeds three feet in height, and is rendered conspicuous and distinctive by reason of its thick branches, usually of a dark colour, very thick and leathery large bright green leaves with only the midrib discernible, and its solitary flowers (usually produced in pairs) in which there is a remarkably broad and somewhat folded or twisted foot-stalk or peduncle without any pedicel or individual flower-stalk under the flower. The peduncle is closely recurved, so that the flowers hang downwards.

The bud is bright scarlet in colour, the almost square calyx-tube with four equal fleshy wings, and the operculum

is distinctly pyramidal. The buds are frequently three and a half inches in length. The filaments are red or pink in colour and incurved in the bud, relatively small for the size of the flower, but rendered conspicuous by their colour. The anthers are oblong, versatile (attached near the middle) and open in parallel longitudinal slits.

The fruit is large, up to three inches in length, four-winged and square in section, with a broad flat disc, and the orifice varies from circular to almost square; the capsule is deeply included together with the four valves. The fruit, at first scarlet, becomes brown with age, and the large seeds are irregularly shaped and winged at the angles, the seed-leaves being broad upwards and not lobed.

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# INSECT *Pests* AND THEIR CONTROL

by C. F. H. JENKINS, M.A. (*Government Entomologist*).

## FULLER'S ROSE WEEVIL (*Pantomorus godmani* Crotch)

**F**ULLER'S rose weevil is a comparatively recent pest to reach Western Australia and so far its activities have only been reported from one or two restricted areas. It is such a serious pest, however, and has such a wide distribution over the globe that all orchardists should be on guard against the beetle and should be prepared to carry out control measures immediately the insect is detected.

The first Australian record of the weevil came from New South Wales (Gurney, 1934) and there appears to be no published record of the insect's occurrence in any of the other Eastern States.

The original home of the beetle is said to be South America (Buchanan, 1939) but it is now known from the U.S.A., California, Mexico, Italy, Africa, France, Spain, the Azores, Hawaii and New Zealand. There has been little opportunity to study the life history of the insect under local conditions, although some work along these lines is in progress. The following information, therefore, is to some extent adapted from the findings of New South Wales entomologists (Hely, 1948) who have had experience with the pest for a considerable period. Investigations in Western Australia have already revealed local differences in the habits of the beetle as compared with New South Wales and further study will probably reveal more. It is unlikely that these

findings will materially affect the control recommendations at present available and further delay in acquainting growers with the information that is available would appear to be undesirable.

### LOCAL DISTRIBUTION

So far, the rose weevil has only been found in the Pickering Brook-Carmel district and at Denmark. Orchardists suspecting the presence of the pest are requested to send to the Agricultural Department specimens of any beetles which are regarded with suspicion.

### DESCRIPTION

The adult weevil may easily be confused with the apple curculio or apple weevil, as superficially the two beetles somewhat resemble one another as does the damage which they cause to various foliage. The weevil is greyish brown in colour and a little over  $\frac{1}{4}$ -inch in length with the typical rostrum or "snout" of



Fig. 1.—Fuller's rose weevil. The photo shows the beetle enlarged about 14 times—adults are between one-quarter and one-third of an inch in length.

—After R. A. Flock.

the weevils or elephant beetles. The mouth parts are placed at the end of the snout as are also the sharply bent or elbowed antennae. The beetle may have a slightly broader snout than that of the curculio and its colouring is duller. The most marked distinction between the beetles is in their habits, as the rose weevil may commonly be found clustering on food plants in the day-time, whereas the apple curculio is typically a night feeder and hides in the soil at the base of the tree during the day.

### LIFE HISTORY AND HABITS

Weevil activity is most pronounced during the summer months but active feeding has been observed in Carmel orangeries right throughout the winter. Egg-laying in New South Wales takes place in the late summer and autumn and a single beetle is said to be capable of laying about 200 eggs. Some of the late eggs may carry over the winter without hatching but the summer eggs hatch in three or four weeks and the tiny orange-coloured grubs drop to the soil where they continue their development.

The eggs are creamy-yellow in colour, and may be deposited in clusters of up to a hundred eggs. Each egg mass is placed in a sheltered situation such as between curled leaves, under stones or loose bark, or between two fruits in contact, and the masses are cemented into place with a fluid which hardens on exposure to the air.

Hatching time varies from a month to several months, depending upon the temperature and other weather conditions. The larval period also

varies considerably in its duration but may occupy up to nine months or more.

The legless grubs are concentrated mainly in the surface six to eight inches of soil, where they feed upon the roots of the host plant. When fully fed the larvae remain inactive for a period in an oval earthen cell, then they pupate and after a period of two or three weeks the adult beetles emerge.

### HOST PLANTS

Rose weevil injury in this State has so far been mainly in citrus groves, but the insect is known to have such a wide host range that no fruit grower can afford to be complacent. They are also known to attack a range of garden shrubs, many weeds and some vegetables. Amongst the preferred plants may be listed the following:—Citrus, passion-vine, blackberry, camelia, rose, peach, plum, dahlia and French beans. Occasional attacks have been observed on *Pinus radiata* and *Eucalyptus* but these are not believed to be favoured hosts.

### INJURY

The most obvious injury caused by Fuller's rose weevil is to the foliage.

The adult beetles chew the leaves to shreds and a heavy infestation will rapidly defoliate a small tree. Bark injury is usually unimportant and fruit damage has not been observed in Australia, although it has been reported abroad.

The effect of the larval root feeding is difficult to assess. Most of the injury appears to be associated with the destruction of root fibres but severe effects from this cause alone on well-tended trees have been difficult to prove.

## CONTROL

### Prevention of Spread.

Although the beetles are unable to fly, the fact that they have a wide host range and cling readily to various objects gives them ample opportunity for artificial dispersal. They are also capable of surviving long periods of starvation and other unfavourable conditions. The fact that no male beetles are known and that every individual is capable of laying viable eggs (parthenogenetic reproduction) further facilitates the beetles' chances of becoming established in a new environment.

Egg masses may be transported attached to leaves and fruits and picking-boxes placed in the orchard may also be used by the beetles as egg-laying sites. All these factors should be considered by the orchardist not only with relation to spread within an individual property, but also from one part of the State to another.

### Cultural Methods and Mechanical Barriers.

Although weevil injury may be quite severe in well cultivated orchards, local observations have shown that abundant weed growth (especially couch in the summertime) favours beetle activity. Wherever possible, therefore, weed growth should be kept under control and trees should be skirted so that the leaves do not touch the ground or adjacent weeds and so afford beetles a ready access from the ground to the branches.



Fig. 2.—Larva and adult of Fuller's rose weevil (enlarged).

—From "The Agricultural Gazette" (N.S.W.)

The controlled use of poultry in orchards has been used effectively in this State against the apple curculio



Fig. 3.—Citrus leaves injured by Fuller's rose weevil.

and is also recommended against the rose weevil. Too much poultry activity in citrus orchards during summer, however, is not desirable as scale populations build up rapidly as a result of the dust covered leaves.

Various types of mechanical barriers have been suggested to prevent flightless insects crawling up the trunks of trees. Such devices are often satisfactory if carefully applied but the slightest negligence renders them useless. A frill of tin or galvanised iron fitted closely to the butt so as to slope down at an angle of 45 degrees will prevent beetles climbing up. Woolly sheep skins fixed around trees with the woolly side out have also proved a deterrent.

Perhaps the most effective of the barrier types consist of tanglefoot preparations applied in a wide band around the butt. A strip of grafting wax or bituminous grafting paint should be applied around the tree trunk first and allowed to dry as this will serve as a suitable base for the sticky compound and prevent bark injury.

## Chemical Sprays and Dusts.

Arsenate of lead has given poor results against the rose weevil, although from the leaf-feeding habits of the beetle satisfactory control from any foliage poison would be expected.

DDT and cryolite sprays have both given good control in New South Wales and could be used in cases of severe local infestations, although the latter insecticide has never been commonly used in this State against any pests. The cryolite formula recommended is  $1\frac{1}{4}$  lb. of cryolite to 40 gallons

of water. The concentration of DDT recommended in New South Wales is 0.5 per cent. so that 20 per cent. water emulsions would require to be mixed at the rate of 1 part to 40 parts of water. This spray has considerable residual effect against the beetles but may produce some unfavourable responses, such as an increase in scale insects.

Cryolite would not have this drawback but may be less efficient against the beetle than DDT. As already mentioned, weeds are important in supporting beetle populations and consequently weed growth should be destroyed in the orchard before spraying operations are carried out. This will increase the kill by concentrating the beetles on the trees before spraying and reduce the means of carry-over.

The mixing of DDT emulsions with white oil and Bordeaux sprays is widely recommended but foliage injury to apple trees from white oil-DDT mixtures has occurred, so other fruits may be similarly affected. No doubt susceptibility to damage will vary with the locality, the condition of the trees and

the variety concerned, but until more evidence is available wholesale spraying with the mixture may be undesirable.

Sprays should be applied when the maximum number of beetles are very active but before extensive egg-laying has taken place. December is probably the most satisfactory month, although if very serious damage is done by overwintering adults and the spring brood, earlier treatments may be necessary.

If DDT is used and scale insects increase abnormally, then a late summer white oil spray should restore the situation.

In addition to the spray treatments just outlined BHC ("Gammexane" or Benzene-hexachloride) and DDT dusts have been found very toxic to Fuller's rose weevil, the former being somewhat the quicker acting. The dusts can best be used as barriers placed at ground level close to the tree trunks.

To gain maximum results the ground close around the butts must be levelled and freed from weeds and other weed growth and trailing branches which may allow the weevils to by-pass the dust barriers must also be removed.

Dust barriers will, of course, not affect insects already established on the tree but will prevent reinfestation from the ground. Sudden jarring, especially of small trees, however, will cause many beetles to fall to the ground and these will be killed when attempting to re-climb the tree.

The dust must be used in sufficient quantity to ensure that a quantity clings to any insect attempting to climb the tree. The most effective concentration tested was a 10 per cent. dust but lower concentrations used more liberally should prove quite satisfactory. Although dust treatments may not be

applicable for the control of some extensive and severe infestations, they may be used to good effect in conjunction with spray applications and cultural treatments, or to protect already clean trees.

### SUMMARY

1. Fuller's rose weevil was first recorded from Western Australia in 1948.

2. The present known distribution in Western Australia is Pickering Brook, Carmel and Denmark.

3. The beetle has a wide host range and the feeding adults may cause severe foliage damage.

4. Most damage in Western Australia is at present done to citrus trees.

5. The larval stage is subterranean and feeds mainly upon fibrous root growth.

6. Beetles are principally active during the spring and summer months but some adults may be found feeding during the winter.

7. The control of weed growth in orchards helps to reduce breeding facilities and renders spray and dust treatments more effective.

8. Spray formulae found effective against Fuller's rose weevil are 0.5 per cent. DDT and cryolite 1½ lb. to 40 gallons of water.

9. Dust barriers of 10 per cent. BHC or DDT placed around the butts of trees will kill beetles climbing to and from the tree trunk.

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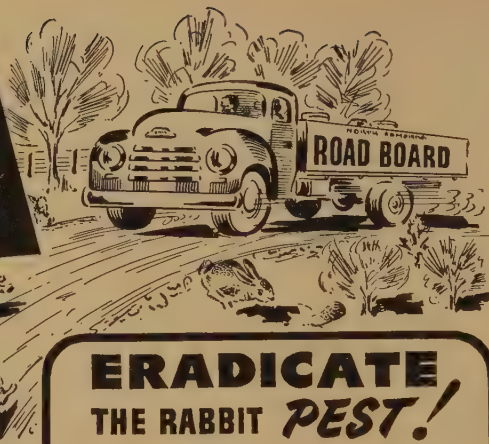
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# THE INSECT VECTOR IN RELATION TO MYXOMATOSIS IN AUSTRALIA

By J. A. BUTTON, B.Sc. (Agric.), Entomologist.

**T**HE rabbit is undoubtedly the greatest single pest with which agriculturalists in this country have to contend. It is, therefore, not surprising that any new and promising method of controlling the pest should be greeted with considerable interest. Although a great deal has already been written regarding the myxomatosis virus a brief and co-ordinated summary of the situation as it now exists in Australia, with particular reference to this State, should prove of value as a guide to the wider establishment of the disease next summer.

## EARLY HISTORY OF THE VIRUS

Myxomatosis first appeared in European rabbits in South America in 1897 and eventually reached California, U.S.A. in 1930. The virus was brought to Australia about this time for research purposes. (Anon a, 1951.)

**Enclosure Trials:** The initial work in this country was concerned with ensuring that its release among the rabbit population would not be followed by spread to man, domestic animals or native fauna. (Bull and Mules, 1944.) As a result of this extensive research the non-susceptibility of other native and domestic animals was conclusively established. Furthermore, the disease was found to be refractory to all rabbit species other than the European (to which the Australian rabbit belongs).

Subsequently experiments in the Eastern States demonstrated the relative effectiveness of the disease as a method of rabbit control under various conditions. The first of these took the form of enclosure or colony experiments conducted with wild rabbits. These early trials extended over a period of about two years from early in 1937 to late in 1938. Conditions of the trial were far removed from natural field conditions. The enclosure was completely netted on the sides and top in order to exclude predatory animals,

and covered an area of about 400 square yards. Two natural warrens were established within the enclosure. The results obtained were most encouraging and conclusively established the effectiveness of the disease in a confined space.

Of more than 600 rabbits which contracted myxomatosis during the course of the trial only two recovered from the disease.

**Field Experiments:** The first field scale trials in Australia were commenced late in 1937 on Wardang Island and later at Pt. Pearce. The enclosures in both cases covered an area of approximately 90 acres. The results of the trials at Wardang Island failed to show that extermination by means of the epizootic was possible even though a considerable population reduction was achieved. Conditions on the island were, however, dry and unfavourable to mosquitoes. Furthermore, no stickfast fleas were present. Greater success was achieved at Pt. Pearce. Here most rabbits were infested with stickfast fleas. The importance of the insect vector was clearly illustrated by the extermination of all but 17 of a total population of about 500 in 60 days.

The first unenclosed field trial with myxomatosis under natural conditions in Australia was subsequently arranged

late in 1942 at Mt. Victor, S.A. (3,125 acres). Unlike the previous trial, migration of the rabbits was permitted under natural conditions thus increasing observational difficulties. However, no reduction in the total population of the trial area was observed.

More promising results came from trials commenced at Melton late in 1942. An encouraging kill of over 80 per cent. was achieved in 32-34 days in one case. Examination revealed that stickfast fleas (*Echidnophaga myrmecobii*) were present in large numbers on the rabbits throughout the experimental area. No significant spread from the area was obtained.

The overall picture obtained from the results of these early field trials was not an optimistic one. There was no indication that a spread from warren to warren was possible under natural conditions.

However, as a consequence of more recent field investigations (commenced April, 1950) by the Wildlife Section of the C.S.I.R.O., myxomatosis has become established widely in river valleys in New South Wales and the Murray Valley in Victoria and South Australia.

It is apparent that the infective agent has been spread by insect vectors, primarily certain mosquito species.

Very satisfactory results have been achieved over wide areas along the main watercourses and also in the larger irrigation districts. Thus good spreads have resulted along many parts of the Murrumbidgee, Lachlan, Darling, Bogan, Macquarie and Castlereagh Rivers in addition to the Murray River.

## VECTOR CONSIDERATIONS

Knowledge obtained by observation in the Eastern States definitely indicates the importance of insect transmission in the recent myxomatosis epidemics. Furthermore, evidence suggests that although other blood-sucking insects may have been concerned the chief vectors are undoubtedly certain mosquito species. Various species of the

genus *Aedes* appear to be involved. These comprise *A. vittiger*, *A. camptorhynchus*, *A. alboannulatus*, *A. theobaldi* and *A. sagax*, the last two mentioned being the most prevalent. Others which appeared to be important, especially late in the season, were *Culex annulirostris* and *Anopheles annulipes*. Another *Aedes* species, *A. camptorhynchus* (common in south-western Australia), appears to offer promise as a most useful vector (Anon, 1951).

**Stickfast Fleas:** It has been demonstrated by Dr. L. B. Bull, of the C.S.I.R.O., that *Echidnophaga myrmecobii* can act as a vector in myxomatosis and, as will be seen subsequently, the probable importance of *Echidnophaga* spp. in Western Australia as an agent of transmission may be considerable.



Stickfast Flea (enlarged).  
[After Monnig.]

**Simulium and Sandflies:** It seems apparent that any blood-sucking insect whose habits favour its repeated feeding on rabbits could behave as a vector in myxomatosis. To be of any significance in an epizootic, however, reasonable abundance and a degree of persistence of the species would be required.

A species of *Simulium* (sometimes referred to as sandflies) has been observed feeding on the ears of rabbits on the banks of the Murray. It would appear that these flies could transmit the disease but the importance of their role is uncertain.

True sandflies (*Ceratopogonidae*) remain still to be established as a significant vector in transmitting the disease (Anon, 1951).

## MYXOMATOSIS IN WESTERN AUSTRALIA

The initial work done in Western Australia (Jenkins, 1944) was in the nature of a stickfast flea survey undertaken with the object of determining whether fleas were sufficiently widespread to serve as vectors of the rabbit virus. This work showed the stickfast flea (*E. myrmecobii*) to be widely established among rabbits in various parts of the State, with the exception of the more southern regions.

The first sample of the myxomatosis virus was obtained in Western Australia in March, 1951, and was immediately injected into laboratory rabbits.

Although it was recognised to be too late in the season to hope that any degree of natural spread of the disease would be achieved at this stage, it was considered that useful experience and knowledge could be gained by carrying out limited trials.

Sites at Muresk and Bejoording were accordingly selected as suitable for observational purposes. Both were considered to have fairly high mosquito and rabbit populations. The trials were primarily aimed at providing experience in swabbing and injection techniques. At the commencement of the last season, however (commencing in August, 1951) infection centres were established in various parts of the State. Selected sites were those considered to provide the most favourable conditions for the satisfactory development of the disease.

Commencing in March, 1952, a series of surveys was made in the areas in question with the view to throwing more light on the insect transmission mechanism operating. In cases where the disease had failed to give satisfactory results it was hoped that the investigation would disclose some explanation for the failure.

At the time the investigation was begun the season was well advanced and many cool nights were encountered, thus rendering it extremely difficult to arrive at very definite conclusions.

Nevertheless, despite the difficulties encountered the following summary has been prepared in the hope that it will prove of some interest and perhaps serve in some measure as a guide to future efforts aimed at establishing the disease. It is also hoped that the following will emphasise the difficulties (imposed by climatic and other factors) which are likely to be encountered in this State.

### Northampton

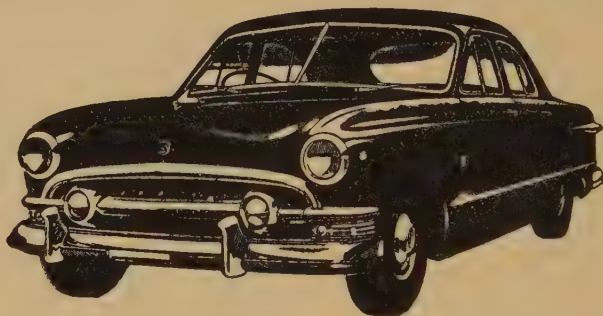
This locality was surveyed in mid-March. Myxomatosis was established over a 1½ mile front on the Bowes River where a 90 per cent. kill had been achieved, and the first evidence of the disease in the Nokenena Creek area was becoming apparent.

All confirmed reports of the disease in this area can be accounted for on the basis of the existing mosquito population. Stickfast fleas (*E. gallinae*) were, however, present in large numbers.

### Geraldton Region

The north-western margins of the Glengarry estate were found to be practically waterless but some isolated soaks with a few mosquito larvae present were observed. The area extending over several square miles had, six months previously, carried a very dense rabbit population. No evidence of rabbit life could now be found and the disease was estimated to have been at least 98 per cent. effective. Local reports maintained that the mosquito population of the area had been insignificant but that stickfast fleas had been dense.

It seems unlikely that mosquitoes could have been the most important vector in the spread of the epizootic in an area such as this.



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The original depot of the Greenough River area had been situated on the river at "Glengarry". At the time of this survey it was claimed that a control of 98 per cent. or more had been achieved. It was also claimed that the mosquito density had been negligible during the flare which commenced as early as September and reached its height during December and January. It was suggested that the sand-fly had been largely responsible for the early flare and that the flea population, which became dense during December and January, continued to spread. The mosquito, it was said, was insignificant until the end of January. Claims such as these, however, obviously need to be investigated.

A report of some interest came from this area and is worth recording. It is asserted that when the disease actually flared at "Glengarry" it was confined within a rabbit-proof fence which divided the river flats from the outer margins. The disease spread rapidly along the river but could not be induced to start outside the fence. Finally the rabbit-proof gates were opened and within a week a spread outside was achieved.

This report is of interest because, on the surface, it appears to strengthen the case for the stickfast flea as an important vector in this region.

The so-called drier region to the north between "Glengarry" and the Mullewa Road was the site of a very extensive spread of myxomatosis which was still progressing. Most of the area was some miles from any watercourse; however, numerous soaks were observed in the gullies. Examination revealed that some contained mosquito larvae, but it did appear that the spread of the disease was such as to suggest that some vector other than the mosquito was also significant.

The last distinct site of the disease examined was an area which stretched for about ten miles along the margins of the East Chapman River. The disease was still progressing towards the

upper reaches of the river, but in the south it had achieved an excellent control and was at a standstill. Mosquito larvae were found at various places along the river, indicating a fair population of mosquitoes distributed over this area. At one locality mosquitoes were trapped coming from most of the rabbit burrows along a half-mile front. The mosquitoes were found to be all the one species (*A. annulipes*). Subsequently this species was also observed in similar circumstances at a locality some eight miles distant from the above.

Broadly speaking, most of the affected areas in the East Chapman region were in close proximity to the river or similar water supply. Fleas were reported to be present in the area but, nevertheless, the mosquito population was quite sufficient to account for the disease spread over most of this region.

From the entomological viewpoint the method of artificial spread employed throughout these areas is of some significance. The vermin inspector responsible concluded, after repeated failures to start the disease, that the cage method of spread recommended by the C.S.I.R.O. was unsatisfactory for local conditions. He found, and has it seems demonstrated, that the most effective technique of bringing about an initial flare is to release numbers of infected rabbits at intervals along the course of the selected stream. The adoption of this technique it is claimed led to a most satisfactory result where the previous method had failed. This again, if its authenticity can be established, also tends to add weight to the theory of the flea as an important vector.

### Bejoording

At the time of the survey the opening rains had already occurred. In consequence many of the smaller brooks and streams had commenced to flow and this could be expected to have had an adverse effect on the mosquito larvae population.

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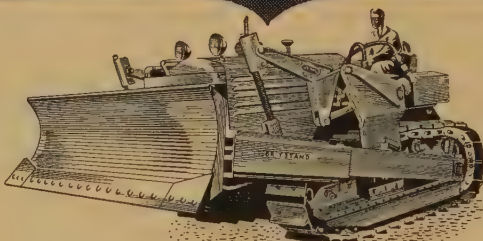
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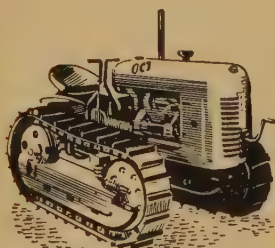
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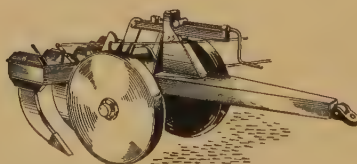
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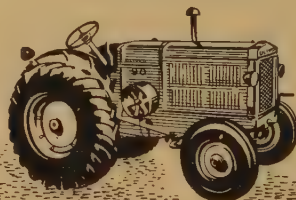
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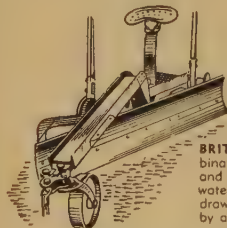
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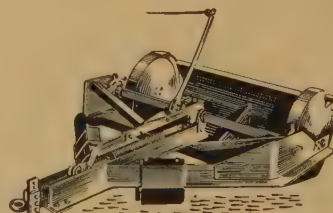


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The survey was commenced at "Glendearg" the property of Mr. Lude-man. In isolated pockets the disease was found to be still active but over most of the property a Grade I condition had been established.

The creek along the northern margin of this property was inspected and no mosquitoes or larvae could be found. The creek banks showed evidence of previously harbouring a moderately dense rabbit population, although indications suggested only very slight present activity. Although no mosquitoes could be found, mosquito-like Chironomids were observed in the burrows. These are not blood-suckers and could not therefore behave as vectors.

Probably the most significant observation made on this property was that the rabbit population appeared never to have been particularly dense (as compared, for example, with the Geraldton area). This fact may well have been the most important factor in the relatively poor progress of the disease throughout this area.

The disease was found to have spread successfully over a property owned by Mr. Blakeston to the west of "Glendearg". The owner claimed that abundant mosquitoes were present in the vicinity of soaks on his property but that no stickfast fleas had been observed to be present on rabbits examined for them.

An examination of the One Man Road locality some miles south of Bejoording Siding revealed no evidence of the disease further than about one mile south of the centre. A healthy rabbit was shot and examined in this locality; only one flea identified as *E. gallinacea* could be found.

Over most of the Bejoording townsite area a Grade I condition had been obtained. This area adjoined and was continuous with "Glendearg". The affected area, then, in the vicinity of the centre was no more than two miles square.

Despite conflicting reports it seems clear that the mosquito vector was the

chief operating factor in the spread achieved.

Other reported outbreaks were investigated but no significant facts emerged nor could the reports be confirmed.

### Bolgart

A reported outbreak at Bolgart on the property of Mr. Manuel was investigated. Here infected rabbits had been obtained from Bejoording, penned and released after seven weeks. The pens had been located between two salt channels of the Bolgart Brook. The first evidence of spread was seen about a week after closing the pens and at the time of our examination had been working for about one month. In some places good Grade I proportions had been achieved. A spread about two miles up both the Bolgart and Yulgan Brook and downstream about one mile from the site of the pens had been obtained. Larval specimens were obtained from the pools and a high mosquito population was reported. An absence of stickfast fleas was maintained.

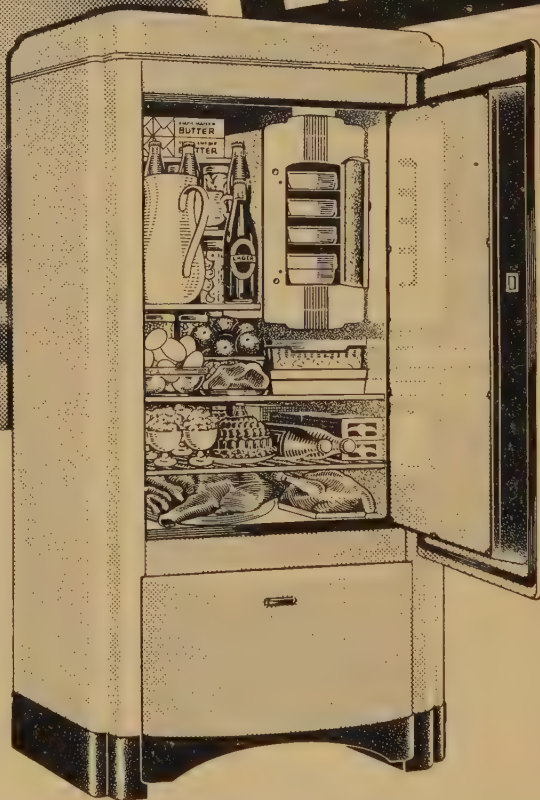
The most significant feature of the spread in this area would appear to be the way in which the disease is confined to the creek margins; the mosquito population is high along the creeks; there is an apparent absence of fleas in the drier adjacent areas and the disease has made no progress whatever in these parts.

### Muresk

Results achieved at Muresk have been very disappointing. Odd infected rabbits have been found on various parts of the property for a considerable period but no worthwhile flare has been obtained. The failure at Muresk is difficult to explain. Mosquitoes have been prevalent for some months and it may be that the rabbit population itself is insufficient to bring about a real flare, or that results have been obscured by inwardly migrating rabbits.

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## Beverley

At Beverley the myxomatosis centre was situated on the Dale River at the property of Mr. Norris who was responsible for the pens. Mr. Norris was contacted on April 8 and he was able to furnish much valuable information. From this and information gathered from extensive operations made over the course of two days, it was possible to complete a general overall picture of the progress of the disease in the area.

The disease was confined to the margins of the Dale River and there was no real spread further than two miles from the river. The affected areas along the river were in the main river flats bounded by either rocky hills or sand plain heath, both of which provided excellent natural breeding grounds for rabbits. The most striking feature of the disease in this region was the continual reinfestation of dead warrens on the river banks, as a result of rabbit migration from the surrounding breeding grounds which had been little affected by the disease.

Mr. Norris has observed the disease clean out one particular warren five times after reinhabitation by migrating rabbits.

The stickfast flea would seem to have been not as prevalent as in previous years and in some parts had been entirely absent. It is possible that this factor may have been partly responsible for the poor progress made away from the river.

However, on the river about 15 miles south of the centre fleas were reported to have been present in large numbers on the rabbits all the season. Furthermore, mosquitoes were numerous. However, despite satisfactory vector conditions no spread of the disease had been obtained.

## Gnowangerup

The survey of this area revealed disappointing results. The disease is persisting in a smouldering condition in numerous isolated and very confined ← perties had the disease achieved a

measure of control. In these places the control has been as high as 90 per cent. However, this has been offset to a considerable extent by the invasion of migrating rabbits from neighbouring unaffected areas. A feature of these few successful outbreaks is the apparent inability of the disease to progress naturally for any significant distance localities. Only on two or three pro- from the infection pens even though the watercourses on which these were situated provided apparently ideal conditions.

## COMMENTS

The differing results in various localities suggest significant environmental dissimilarities. This, however, was not the case. Where the disease was apparently being maintained in only a smouldering state environmental conditions did not appear to differ markedly from those prevailing where the results had been more satisfactory. In both cases pens were located in favourable positions adjacent to creek or river pools and mosquito activity had apparently been quite high. Furthermore, stickfast fleas were generally prevalent in most areas.

Clearly, then, the "smouldering" condition is not easily accounted for, but it is possible that the results of the disease, in certain localities at least, were partly obscured by rapid reinfestation of migrating rabbits in the vicinity.

It seems possible that more suitable weather conditions may occur in future seasons. The two inches of rain which fell in the district in December by disturbing the stagnant condition of the pools, may temporarily have had an adverse effect on the mosquito population.

Even so indications suggest that because of the coolness of the nights, and perhaps other limiting factors operating in this part of the State, more difficulty may be encountered in making use of myxomatosis as a means of rabbit control. The potential value of the disease would appear, nevertheless,

to be high. It is clear in a district such as this that a factor of the utmost importance is the co-operation of every farmer. No worthwhile results can be obtained if the efforts are isolated and the pens widely separated. It is necessary for each individual farmer to co-operate in a concerted and patient attempt to spread the disease. If such is attempted a considerable degree of control can be expected.

### SUMMARY

Generally, results achieved this season have been most encouraging, especially those obtained from the Greenough area. In many of the other districts the main factor limiting success would appear to be apathy on the part of the local farmers

In most regions the mosquito appears to be the chief agent responsible for the spread of the disease, the most prevalent species being *A. camptorhynchus*, *A. alboannulatus*, *C. fatigans* and *A. annulipes*. The stickfast flea appears to have played a significant role in parts of the Greenough area and may in subsequent seasons become more important in other parts of the State.

The prevalence of the poultry "stickfast" (*E. gallinacea*) on the rabbits, as

revealed in this survey, is of interest. A number of previous records have been reported but several of these have subsequently been shown to be based upon erroneous identifications (Seddon, 1951). The Western Australian specimens referred to by Seddon were submitted for identification to Dr. Jordan of the British Museum.

Lice of the Family Haematopinidae (probably *Haemodipsus ventricosus*) have recently been recovered from rabbits at Bridgetown and Manjimup. *H. ventricosus* has been shown by the C.S.I.R.O. to transmit the disease under laboratory conditions.

There is an apparent need for further study of the vector factor in myxomatosis in this State. A greater understanding of this aspect of the disease is important in order that the potential application and value of the epizootic in Western Australia can be more accurately assessed.

### ACKNOWLEDGMENT

The author is indebted to Mr. D. J. Lee, School of Public Health and Tropical Medicine, Sydney, for valuable assistance in the identification of mosquitoes submitted to him.

## RECORD OF BLOOD-SUCKING INSECTS FROM MYXOMATOSIS AREAS (SEPTEMBER, 1951 - AUGUST, 1952)

|                                     | Spring<br>Sept.-Nov. | Summer<br>Dec.-March | Autumn<br>April-May | Winter<br>June-August |
|-------------------------------------|----------------------|----------------------|---------------------|-----------------------|
| <i>Aedes alboannulatus</i> ....     | 12                   | 1, 6, 7, 10          |                     | 3, 14, 4, 15          |
| <i>A. camptorhynchus</i> ....       | 1, 2, 8, 12          | 8, 9                 | 6                   | 3                     |
| <i>A. aegypti</i> ....              | 4                    | 6                    |                     |                       |
| <i>A. notoscriptus</i> ....         |                      | 10                   |                     |                       |
| <i>Culex fatigans</i> ....          | 6, 12                | 1, 3, 6, 7           | 3, 6                | 3, 14                 |
| <i>C. annulirostris</i> ....        |                      | 10, 11               |                     |                       |
| <i>Anopheles annulipes</i> ....     |                      | 1, 6, 9, 10          | 3, 6                | 3                     |
| <i>Echidnophaga myrmecobii</i> .... |                      | 3, 8, 6              | 6, 8                | 14                    |
| <i>E. gallinacea</i> ....           |                      | 1                    | 1, 3, 8             | 3, 14, 1              |

### Key to Centres:

|               |                 |                |                |               |
|---------------|-----------------|----------------|----------------|---------------|
| 1. Geraldton  | 4. Kellerberrin | 7. Narrogin    | 10. Donnybrook | 13. Manjimup  |
| 2. Moora      | 5. Muresk       | 8. Gnowangerup | 11. Coolup     | 14. Moonijin  |
| 3. Bejoording | 6. Beverley     | 9. Bridgetown  | 12. Kojonup    | 15. Cunderdin |

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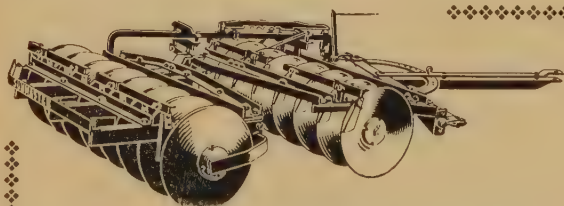
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# PLANT DISEASES

## CROWN GALL OF FRUIT TREES AND OTHER PLANTS

By W. P. CASS SMITH, B.Sc. (Agric.), Government Plant Pathologist

**C**ROWN gall is a widespread bacterial disease which affects many different plants. It is most frequently noticed on fruit trees particularly pome and stone fruits, but it also attacks grapes, berry plants, and ornamentals, including roses.

In nurseries where fruit trees or other susceptible plants are propagated, the disease often becomes very troublesome, and as infected stocks have to be rejected, it may also prove very costly. In the orchard, the effects of the disease are variable. Young trees, which are diseased when planted out, or which become infected soon afterwards, usually make unthrifty development and eventually die, whereas older trees which contract the disease may remain vigorous for years. Serious damage from the disease has been noticed more frequently here on stone fruits, such as peaches, nectarines, almonds, plums, etc., than on pome fruits, such as apples and pears.

### SYMPTOMS AND CAUSE

Crown gall is caused by a bacterial organism *Agrobacterium tumefaciens*,



Fig. 1.—Crown gall on rose bush

which inhabits the soil and apparently occurs naturally in many areas. It can only invade plants and cause infection, however, through the medium of wounds. The presence of the bacteria within the invaded plant cells stimulates abnormal cell division, leading to

infection. This explains the frequent occurrence of galls in the crown region of fruit trees or at the base of cuttings, and also the prevalence of the disease in nurseries, or other places where vegetative propagation of susceptible plants is carried out.



Fig. 2.—Crown gall on young apple trees.

the development of outgrowths or galls which range in size from half an inch or so up to several inches in diameter. The galls are more or less round with a convoluted surface and, on fruit trees, they become hard and woody in texture.

Wounds made by grafting or taking cuttings provide avenues through which the causal bacteria in contaminated soil commonly enter and cause

Galls may also develop at other places where injuries occur. They are often noticed on lateral roots which are injured by implements or insects, etc., and more rarely they are seen on the above-ground parts. In one instance heavy infection was noticed on the stems of grape cuttings following a severe rain and hail storm which presumably splashed contaminated soil on to the hail-injured stems. True crown gall should not be confused with the burr-knots commonly seen on quinces and some varieties of apples. These are non-parasitic structures which are inherent to the variety.

## CONTROL OF CROWN GALL

### A—In the Nursery.

1. Every effort should be made to prevent a build-up of crown gall in the nursery, and to achieve this, the rejection and early disposal by burning of all stocks or worked trees on which galls are noticed, is of paramount importance.

2. Care should be taken to avoid undue wounding of roots or crowns, and grafts should be well made to give a close fit of stock and scion. Disinfection of stocks and scions, grafting

bench and knives will also give added protection.

3. Heavily contaminated soil may be disinfected with steam, or 2% formalin solution, but owing to high cost, disinfection is only applicable to small areas, such as seed-beds or beds used for callousing cuttings, etc. For larger areas rotation should be practised so that susceptible plants such as stone fruits are alternated with resistant kinds.

4. Alkaline soils favour infection, therefore, lime should not be used unnecessarily. Applications of sulphur at the rate of 5lb. per 100ft. of row, or 400 lb. per acre have been recommended for reducing infection. When peach pits are planted for seedling stocks, the young seedling is often injured at the root-stem junction during emergence from the stony shell. This explains the common occurrence of crown gall at this site (see Fig. 3). American workers report that infection may be reduced considerably by dipping the pits in a well stirred calomel suspension (4oz. calomel in 1 gal. water) for several minutes, then allowing them to dry before planting.

#### **B—In the Orchard.**

1. All planting stock should be carefully inspected and any young trees showing galls should be discarded. Sur-



Fig. 3.—Crown gall on peach seedlings.

gical removal of galls before planting will not ensure disease freedom.

2. When trees are removed because of crown gall infection, replanting should not be made unless the soil is sterilised, or replaced with clean new soil. Soil may be sterilised by watering with 2% formalin solution (= 1 gal. commercial formalin in 49 gal. water) at the rate of 1 gal. per square foot.

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3. Methods of eradicating crown gall on established trees by disinfectants are at present being investigated. Promising results have been obtained on stone fruit trees by the following treatment: Remove the soil from the base of the tree and brush the gall free of soil with a stiff brush; paint the gall and an inch

wide surrounding strip of live bark with a mixture containing three volumes of methanol and one volume of sodium dinitro ortho cresylate (sold commercially as Dinoc, Nocweed D. etc.). If necessary the galls should be repainted once or twice at intervals of approximately four to six weeks.

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## BLACK ROT OF STOCKS

By R. F. DOEPEL, B.Sc. (Agric.), Plant Pathologist

**S**TOCKS are easily grown plants deserving of a place in every garden. They are adapted to a wide range of cultural conditions and a colourful show of flowers can be obtained by planting suitable varieties. Black rot is a serious bacterial disease (causal organism *Xanthomonas incanae*) of these plants and is responsible for heavy losses in some plantings.

Recorded in this State for the first time in 1945, the black rot disease has been so named by other investigators because of its similarity to the black rot disease of cabbage.

The appearance of this disease in the seedbed or garden can be attributed in many instances to the planting of infected seed.

### SYMPTOMS

The symptom first noticed is a yellowing of the lower leaves which hang down and readily fall from affected plants. A distinct blackening of the stem tissues occurs at the points of attachment of these leaves to the stem. On cutting the stem open lengthways this blackening can be traced in the water-conducting tissues.



BLACK ROT OF STOCKS: Note blackening of water conducting tissues in the stems (exposed in these specimens) and its extension to the points of attachment of the leaves to the stems.

If the infection is severe, young plants may wilt and die whereas older plants become stunted although still capable of producing blooms.

### CONTROL MEASURES

Losses from this disease may be reduced by the adoption of the following control measures:—

1. Save seed only from healthy plants.

2. If seed of unknown origin is to be used it should first be hot water treated, for the disease organisms may be carried internally in the seed tissues.

Seed to be treated is tied loosely in a cheesecloth bag and immersed for ten minutes in water maintained at a temperature of 133 to 134 degrees Fahrenheit (56 to 56.5 degrees Centigrade). Following this treatment, the bag of seed is removed and plunged

into cold water. The seed is then taken out and thinly spread out to dry on newspaper in the shade.

3. Sow seed thinly in new or sterilised seed bed soil. Soil may be sterilised by treatment with 2% formalin solution (1 part formalin to 49 parts of water) applied at the rate of one half to one and a half gallons per square foot two or three weeks prior to planting. Treated soil should be covered with wet bags for a few days to prevent the fumes escaping too rapidly and should be dug over prior to planting.

4. Adopt a rotation so that stocks are grown on the same land only once in two or three years.

5. Remove and burn diseased plant remains to reduce soil contamination.

Further information on these diseases may be obtained from the Plant Pathology Branch, Department of Agriculture, Perth.

---

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# SEASONAL REMINDERS

An illustration of a calendar with a pencil resting on it, positioned diagonally behind the main title.

## *Tobacco Notes for January-February*

**N**OW that the plant is fully grown and leaves are maturing, growers should be on the way towards commencement of harvesting and curing. These operations can seriously reduce the value of a good crop if handled carelessly. If you have an even crop and are using inexperienced labour, it is possible to go around the crop the day before harvest and say how many leaves are to be picked from each plant. There may be from two to five. In an uneven crop this is impossible.

As all experienced growers are aware, there are no set rules which can be laid down for the curing of a crop. The treatment of leaf from various parts of the paddock varies, so it is wise to endeavour to fill a kiln with leaf harvested from similar soil types and from similar positions on the plant. This will also facilitate bulking and grading.

Only experience will enable a grower to determine when leaf is ready to be harvested. However, the following hints may be of value in assessing ripeness. As the plant approaches maturity, the dark green colour characteristics of normal growth changes to a yellow mottling with heavy-bodied leaf and a yellowish green in the case of light-bodied leaf. In addition, the leaf becomes more brittle, and assumes a slightly more horizontal position in relation to the main stalk. Bottom leaves are light in body, and should be harvested slightly on the green side.

It often happens during harvesting that rain will follow a period of dry

weather. This causes plant food material in the soil to be rendered assimilable by the plant, thus turning leaves green again. In such cases, it is generally safe to harvest the day immediately following rain, otherwise a week should elapse before harvest.

The best results from curing are obtainable when the kiln is filled the one day with uniform leaf, harvested in the morning before the leaf begins to wilt. If, however, it is necessary to fill the kiln over two days, it is always best to place leaf picked on the first day in the bottom of the kiln. Heavy bodied leaf should be placed in the top of the kiln.

### CURING

The curing of tobacco can be divided into three stages, and I will attempt to give a broad outline of the process involved in each stage. As mentioned previously, however, there are no hard and fast rules which can be laid down.

1. **Yellowing and Fixing Stage.**—High humidity with little or no ventilation.

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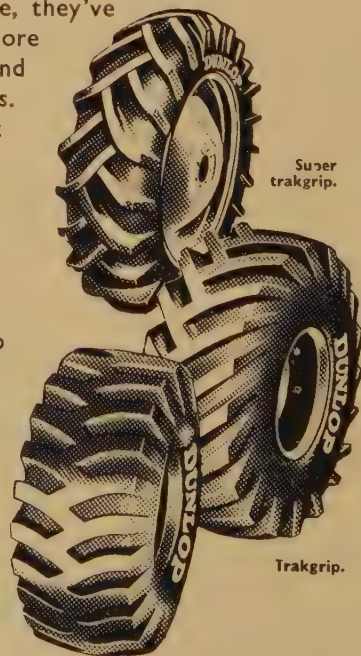
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Wet bulb thermometer 4° below dry bulb. Temperatures from 85-100° F. Keep at low temperatures till two-thirds to threequarters of leaf has turned yellow. Gradually raise temperature 1°-2° per hour) to 105° with some bottom ventilation. Top vents may be opened if there is excessive humidity in the kiln. Make sure that leaf does not dry out faster than the colour develops. By this time, the leaf should be yellow at the tips and showing a lemon colour tinged with green towards the butt. Raise temperature slowly to 110° F. and adjust ventilators to give a wet bulb reading 8-10 degrees below the dry bulb. Leaf tips should commence to dry and curl at this stage.

**2. Drying the Web of the Leaf.**—By the time the tip commences to curl, the majority of the green should have disappeared from the leaf. The web of the leaf is now dried out by raising the temperature slowly to 115° F., and hold there until the leaf margins commence to curl. After this, raise the temperature slowly (1-2° per hour) to 120° F. and hold until the majority of the web of the leaf on the bottom tier is dry. The difference between the wet and dry bulb should now read from 15°-20° below the dry bulb. The web of the leaf on the second tier is then dried by

raising the temperature to 125° F. After the second tier leaf is dried, the temperature can be raised by 2° to 3° per hour till it reaches 140° F. The difference between wet and dry bulb thermometer should now be 20°-30°. If the difference diminishes, it means that there is too much humidity in the kiln, and more ventilation is needed. It is at this period when leaf is most likely to sponge.

**3. Drying of the Midrib.**—Once the leaf is dry, very little ventilation is needed for drying out of the midrib. This is done by raising the temperature by 4° to 5° an hour till it reaches 160°-170° F. The kiln is held at this temperature until all midribs, especially in cold corners, are dry. It is unwise to carry temperatures over 170°, since scorching and reddening of the leaf then takes place.

The amount of top and bottom ventilation needed throughout the curing process depends largely on the airtightness of the kiln and condition of the leaf. The higher the moisture content of the leaf, the more ventilation needed during the various phases. The humidity decreases, and thus the difference between wet and dry bulb thermometers increases, as the temperature is raised.—T.G.H.

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## *Wheatbelt Notes*

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**JANUARY** should see the completion of harvesting and this is the time to clean and store the harvesting machinery and check any parts required for the next season. Opportunities may present themselves to arrange for an overhaul of the tractor and other machinery.

Most of the sheep will now be moved on to the stubbles and care should be taken to reserve the best grazing for the mated ewes and weaners.

Do not overgraze the paddocks as bare paddocks provide ideal conditions for soil erosion.

Be sure that stock water supplies are plentiful and of good quality.

### **February Activities**

February is a suitable month for the grading and pickling of next year's seed. Oats and barley should be dry

pickled with organic mercury dusts and the seed wheat treated with copper compounds for the control of ball smut.

At this stage make a careful check of the machinery for cultivation and seeding and place orders for any spare parts that are needed or are likely to be needed during the season.

Regular inspection of the sheep flocks will pay good dividends and it may be necessary to start hand feeding during

this month. Where possible the ewes should have grain, while cereal or meadow hay should be made available to the dry sheep. Remove the rams at the end of this month.

Top dressing may be commenced, using  $\frac{1}{2}$  cwt. of super or more on the old pastures which had been previously top dressed for ten years or more and up to  $1\frac{1}{2}$  cwt. for pastures on relatively new land.

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## *Horticultural Notes*

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**P**ROVIDED stone fruits have reached a suitable stage of maturity when picked they will continue to ripen satisfactorily. However, if harvested too green, the fruit will not develop a good flavour and the general quality will be inferior. The correct stage for picking is best judged by the change which occurs in the green ground colour of the fruit.

When the green begins to show a yellowish tinge, the fruit may be safely picked. In the case of coloured fruits, particularly plums, the development of colour also indicates ripening. Fruit required for export or storage purposes should be picked while still very firm, but for local market purposes much riper fruit can be forwarded provided softening has not occurred. Fruit packed in trays may be forwarded in a more advanced condition than when packed in cases.

### **Pre-harvest Drop of Pome Fruits**

Losses through dropping of Bartlett pears, Jonathan and Delicious apples can be largely prevented by the application of a spray containing naphthalene acetic acid which is marketed under a number of trade names. The spray should be mixed according to the manufacturer's instructions and applied two to three weeks before normal harvest, making sure to thoroughly wet the trees and in particular the stems of the fruit.

### **Summer Pruning of Apricots**

The difficulties of controlling vigorous growth in apricots which often results from winter pruning can be largely obviated by pruning in late February. Pruning at this time also enables heavily overgrown trees to be thinned out without resulting in the production of strong uncontrollable growth.

### **Budding of Deciduous Trees**

Trees which have been prepared in the winter for reworking in the summer may be budded during late January and early February. Plump buds on well developed shoots of the desired scion variety should be chosen and inserted in the bases of selected well-placed shoots which have developed as the result of cutting back the tree during the late winter months. The buds should not shoot until the following spring but attention is necessary to see that the ties are loosened as the bud expands. Nursery stocks are also budded at this time.

## PESTS

### 1. Scale Insects.

For the control of scale insects apply a spray of 1 gallon of white spraying oil to 40 gallons of water. Complete coverage of all parts of the tree is essential and for this purpose equipment capable of delivering a pressure in the vicinity of 300 lb. per square inch is necessary.

For white wax scale, apply the spray as soon as the young insects are well hatched and appear in numbers on the mid-rib of the leaves (usually early January) and follow with a second spray two to three weeks later.

Where spraying for red scale is necessary apply the spray during late January or February and if required follow up with a second spray a month later.

If citrus white fly is prevalent add  $1\frac{1}{4}$  pints of nicotine sulphate to the spray mixture.

### 2. Fruit Fly.

A rapid increase in fruit fly populations usually occurs during January and constant attention is necessary to keep the pest under control.

Foliage baiting should be carried out consistently using the following mixture:—

1 oz. sodium fluosilicate.

$2\frac{1}{2}$  lb. white sugar.

4 gallons of water.

All stone fruit trees, either carrying fruit or recently stripped, pears, early apples and figs require attention, not forgetting citrus trees which have not been completely stripped of fruit.

Pick up all fallen fruit regularly—soft fruits preferably every day, and destroy by boiling or burning. Orchard sanitation is particularly important to prevent rapid increase of the pest and should be extended to include all odd fruits hanging on trees stripped of their commercial crop.

### 3. Apple Curculio Beetle.

When signs of the second brood of curculio beetle are noticed (usually in February) apply 4 per cent. B.H.C. dust in a complete ring around the base of each tree. Ensure that there are no alternate means of the beetles reaching the foliage other than by the trunk.

Alternatively, if desired the following baits may be used:—Mix 1 lb. sodium fluoride with 9 lb. minced apple and apply round the bases of the trees at the rate of approximately 15 lb. per acre.

Arsenate of lead sprays should not be used at this stage or the fruit will be contaminated.

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## *Beekeepers' Notes*

**D**URING the hot weather of January and February, beekeepers should ensure that their bees have adequate water supplies readily available. There is a widespread impression that bees do not require much water when they are working on an ample nectar flow, but last year's marri flow proved the fallacy of this belief as at all times the bees sought water apart from that obtained from the nectar.

Every bee that is carting water means a reduction in the nectar-collecting staff and therefore lack of an easily available supply of water is apt to be reflected in reduced yields of honey. One of the most convenient methods of

providing water is to have 44-gallon drums filled with water, with some palm leaves or twigs from scrub placed in the top of the drum so that the bees can obtain water and fly away without risk of drowning.

The summer months are dangerous periods for beekeepers, as many hives have been lost through bushfires. Make sure that your apiaries are protected by fire-breaks and remember to always carry your knapsack spray on the truck, filled with water and ready for instant use. Shovels, beaters and supplies of water for refills should also be carried when travelling in the bush.

Carry your smoker in an old honey tin and empty it into another tin when finishing work in the evening, making certain that the smoker fuel does not

contribute to the fire risk. Keep the ground round the hives well raked, and if possible have a cleared strip at least 20 feet wide surrounding the apiary. It is not worth taking chances on these matters as hives are too valuable to lose for a lack of a few hours of work.

The attention of all beekeepers is drawn to the fact that it is necessary for them to re-register their apiaries for 1953 not later than December 31, 1952. Application cards are available from the Government Apiculturist, Department of Agriculture, Perth.

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## *Veterinary Notes*

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**W**ITH the approach of summer, farmers in the drier districts should take the precaution of protecting their livestock against toxic paralysis by inoculation with botulinus toxoid. This disease affects both sheep and cattle, and usually results from the consumption of carrion or bones contaminated by the microbe *Clostridium botulinum* which, during the course of its growth, produces an extremely potent toxin or poison.

As the summer advances, the dry grazing deteriorates and becomes inadequate to satisfy nutritional requirements. Under these conditions, depraved appetite accompanied by carrion eating and bone chewing is commonly observed, and should this material be contaminated with *Cl. botulinum*, losses from toxic paralysis are certain to occur.

Outbreaks of the disease have been most serious in seasons when rabbits have been numerous, since these pests not only hasten the rate at which deterioration of the pastures takes place, but also provide an abundance of toxic carrion, when measures have to be adopted for their destruction.

Toxic paralysis may be prevented by inoculation with botulinus toxoid which should be given by subcutaneous (under the skin) injection in a dosage of 5 c.c. for sheep and 10 c.c. for cattle. The injection of this product results in the development of a strong and lasting

immunity which becomes effective in 14 days and is sufficient to prevent losses from the disease for a period of at least a year.

Since the risk of toxic paralysis is greatest during January-April, inoculations should be completed before the end of December. Further information is contained in Leaflet No. 650 which will be supplied by the Department upon application.

### **BLACKLEG**

During the past two years mortalities from blackleg have occurred among cattle in the South-West, despite inoculation with routine blackleg vaccine. This product has proved highly effective for the prevention of the disease for many years, but for reasons yet unexplained it appeared to suddenly lose its value as an immunising agent.

To overcome this difficulty, a special vaccine prepared from new strains of *Clostridium Chauvoei*—the microbe

which causes the disease—was obtained from the Commonwealth Serum Laboratories for the re-inoculation of herds on which the routine vaccine had failed.

The results were highly satisfactory since no further mortalities from blackleg occurred in any of the 29 herds in which re-inoculation with the new vaccine was carried out.

This product is now being marketed as the routine blackleg vaccine, and supplies may be obtained direct from the Commonwealth Health Department, G.P.O., Perth.

The dose for cattle is 5 c.c. given by subcutaneous injection. Calves should be inoculated at the age of three to six months.

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## *Poultry Notes*

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**I**N well-cared-for flocks, de-worming will have been carried out at 10 weeks of age and the birds should be de-wormed for the second time when they are 18 weeks old. This rids the alimentary canal of any worms that may be present and, as a result, the birds often display a marked improvement in health.

The pullets should be graded as they are transferred to the laying quarters. Backward pullets should be segregated from the main flock to give them an opportunity of faster development.

Adequate feeding receptacles should be placed in the poultry house and in shady positions of the yard. Allow approximately 24 linear feet of feeding space to 100 birds. Provide a receptacle containing insoluble blue metal chips (one-eighth screened) at all times.

Clean out the nest boxes and refill with three inches of clean, pine sawdust.

Before the pullets are transferred to their laying quarters, all woodwork in the laying sheds should be creosoted. Special attention should be given to joints and crevices in the woodwork. Broody coops should not be overlooked.

The laying houses should be left vacant for ten days following this treat-

ment to enable the creosote to soak into the wood. In this way, burning of the birds will be obviated.

Inspect feeding and watering receptacles to see that they are in working order. Re-conditioning the deep litter in the laying houses is important. Leave enough of the old built-up litter to cover the floor to a depth of two inches. Apply hydrated lime to the surface of the litter at the approximate rate of one kerosene-tinful to a shed with floor dimensions of 32ft. x 16ft. Incorporate the lime into the litter and add a surface of two inches of clean, dry jarrah sawdust.

To prevent the surface of the litter from caking, during the winter months, approximately six applications of hydrated lime should be sprinkled over the litter and then incorporated in the litter with the assistance of a forked hoe.



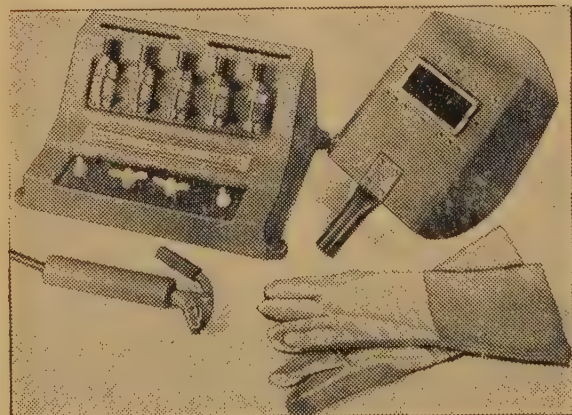
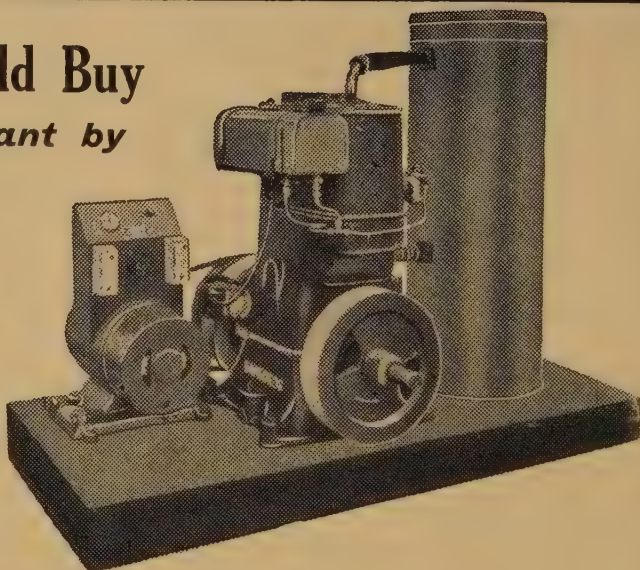
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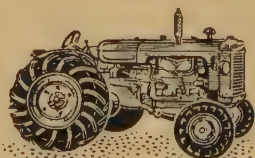
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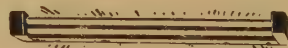
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# THE DISTRIBUTION OF SOME OF THE MORE IMPORTANT TOXIC PLANTS OF SOUTH-WESTERN AUSTRALIA

By R. D. ROYCE, B.Sc. (Agric.), Botanist

FROM the earliest days of settlement in Western Australia, native species of plants have been responsible for stock losses. As early as 1837, the plant now known as York Road Poison, was apparently causing the death of cattle, sheep and goats in the Guildford area, although the cause of the losses was at that time unknown. By 1842, James Drummond, the earliest of the botanical workers in Western Australia, had identified at least three species of *Gastrolobium* and one species of *Oxylobium* as being toxic. Subsequent experience in the field, together with experimental evidence has proved that 25 species of *Gastrolobium* and six species of *Oxylobium* are toxic to stock.

Just as an effective programme of weed control is largely dependent on one's ability to identify weeds, so the prevention of stock losses due to poisonous plants can be made effective only where the species are readily recognised. To assist the farmer in this direction a series of articles by the Government Botanist (Mr. C. A. Gardner) is being published in this journal, and the third article of the series, which appeared in the July-August issue, dealt with all the known toxic species of *Gastrolobium* and *Oxylobium*. The key provided in that article, together with the excellent illustrations which have been published by the West Australian Newspapers Ltd., should enable farmers to identify most of the poisonous plants which they might encounter.

It is sometimes useful, however, to know what species are likely to occur in any particular district. Generally speaking, the poisonous species have a fairly limited range, and a knowledge of their distribution would give a farmer an indication of what plants should be looked for in bush country in any locality. Furthermore, each species is

usually found restricted to a particular soil type, and details of this association are set out in the previous article.

In order to supplement the information so far available, a series of maps has been prepared in collaboration with Mr. Gardner to illustrate the distribution of the more important toxic species in the South-Western portion of this State, and including some plants other than those in the genera *Gastrolobium* and *Oxylobium*. A study of the maps will enable a farmer to considerably narrow down the field of his search in the identification of a supposed poison plant. Thus a farmer at Bonnie Rock would know, after consulting the maps, that his property might possibly carry stands of Cluster Poison, Wodgil Poison, Pituri and Lamb Poison, while at Nannup he would know that he would be most likely to find Heart-leaved Poison, River Poison, Prickly Poison, Blind Grass and Lamb Poison.

It should always be remembered, however, that in the main, distribution maps give only an approximate idea of the range of the plant concerned. Isolated areas due to soil variation may

occur outside the indicated limits, while large areas within the limits may be free from the plant due to the same cause. Moreover, only 38 of the most important species have been dealt with, and there remains a large number of plants, both native and introduced, which are capable of causing stock losses, but which have not proved the same economic problem as have those which are included here. Despite these limitations, however, the maps should prove useful to the farmer, particularly those contemplating opening up land in new districts.

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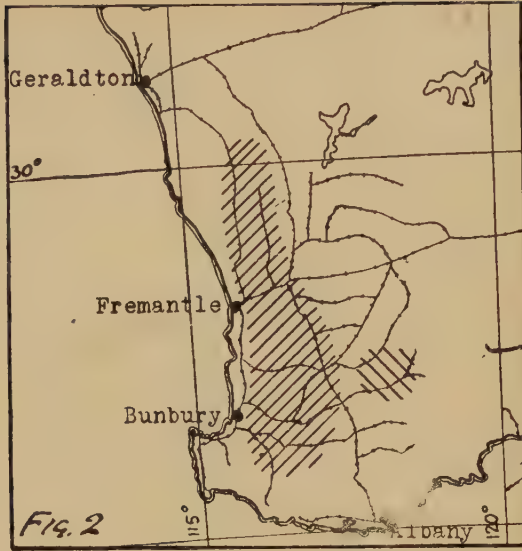
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BULLOCK POISON (*Gastrolobium trilobum* Benth.)



PHILLIPS RIVER POISON (*Gastrolobium stenophyllum* Turcz.)



CRINKLE-LEAVED POISON (*Gastrolobium villosum* Benth.)



MALLET POISON (*Gastrolobium densifolium* C. A. Gardn.)



WANDOO POISON (*Gastrolobium polystachyum* Meissn.)



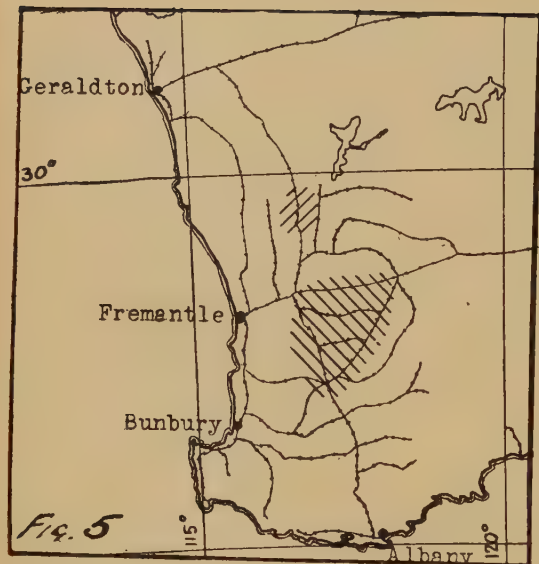
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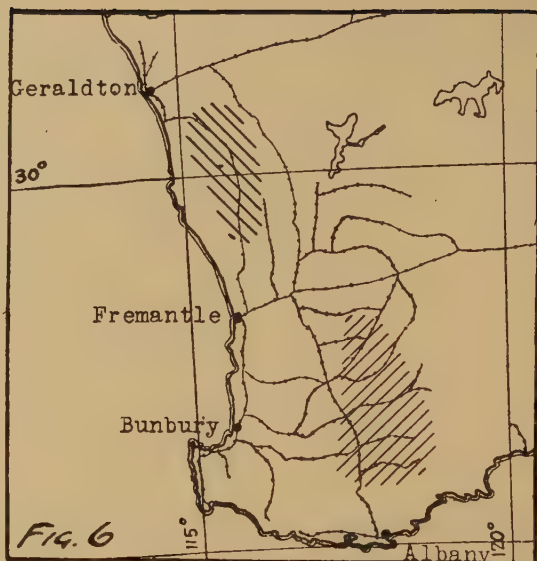
ROCK POISON (*Gastrolobium calistachys* Meissn.)



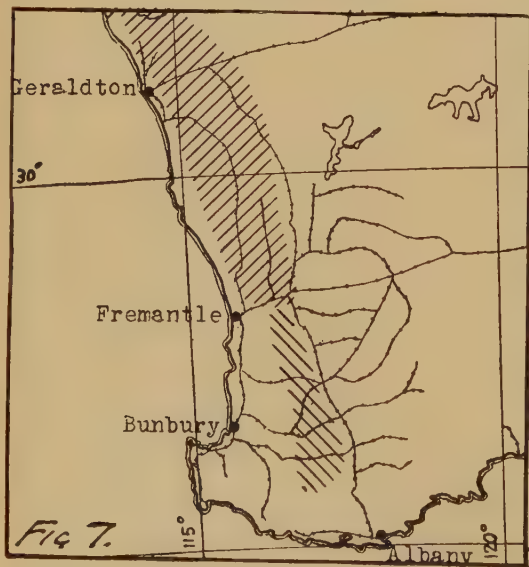
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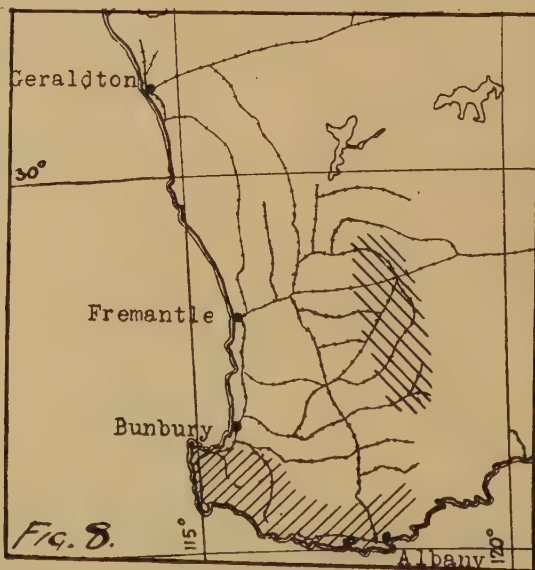
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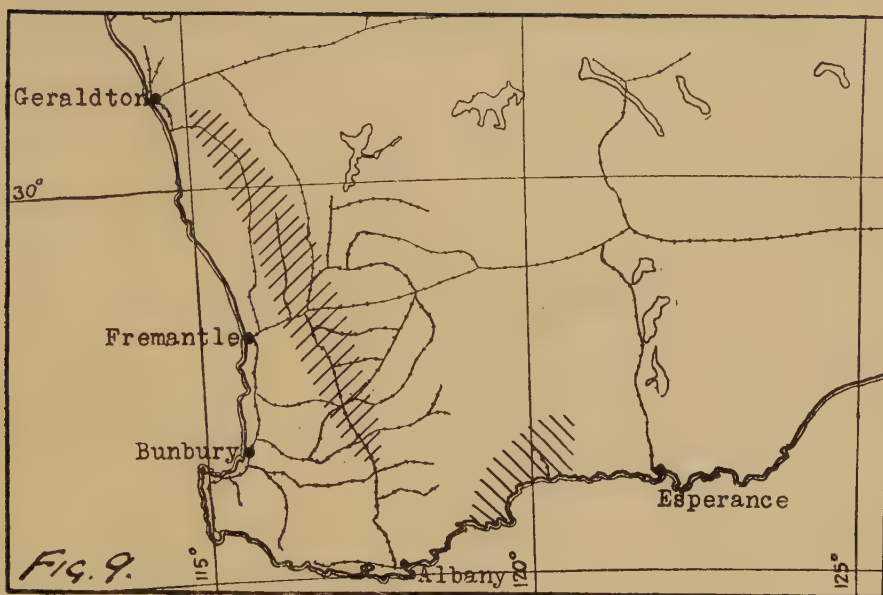
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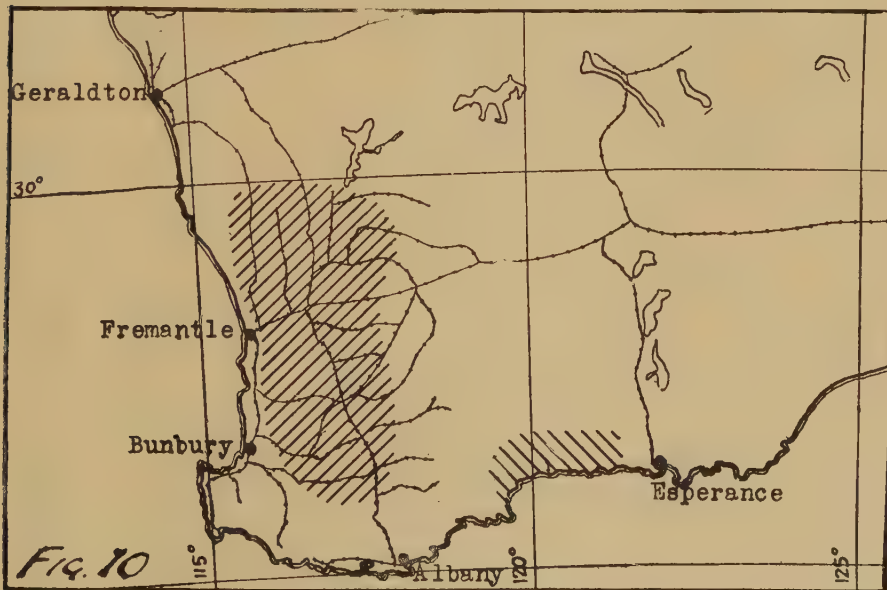


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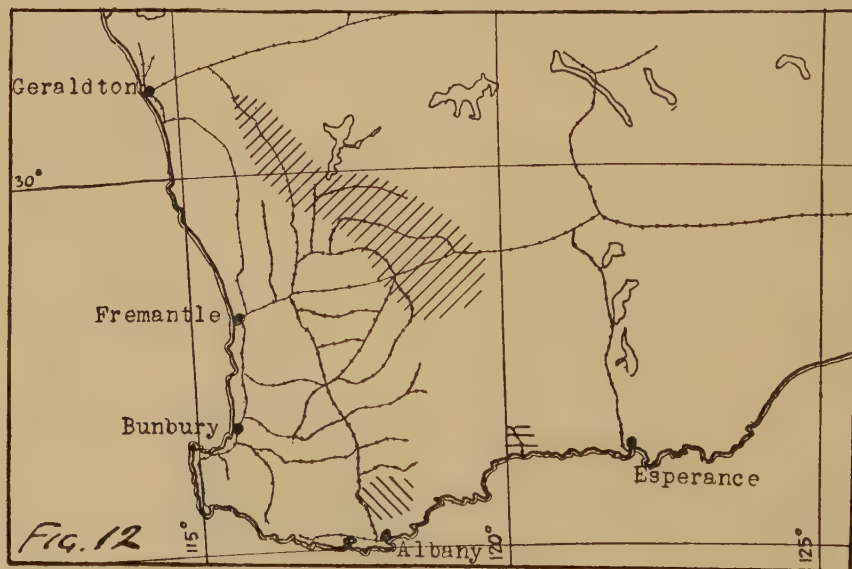
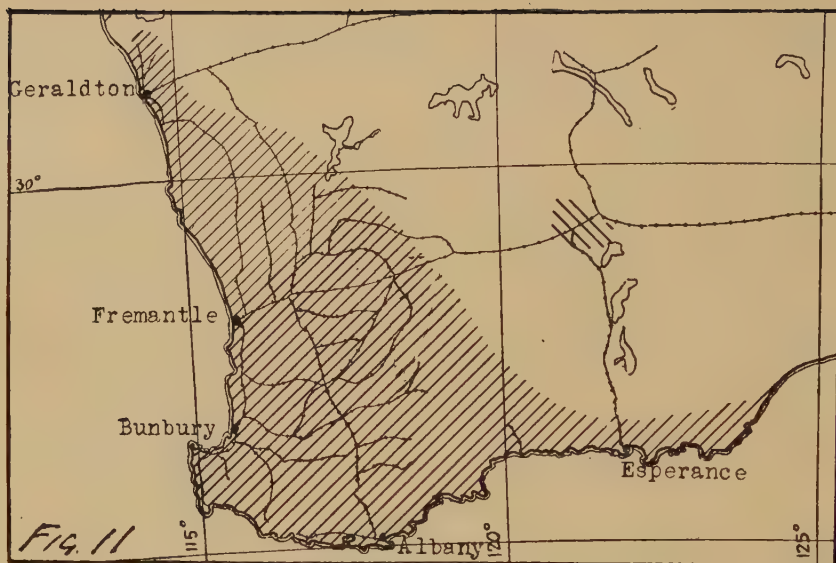
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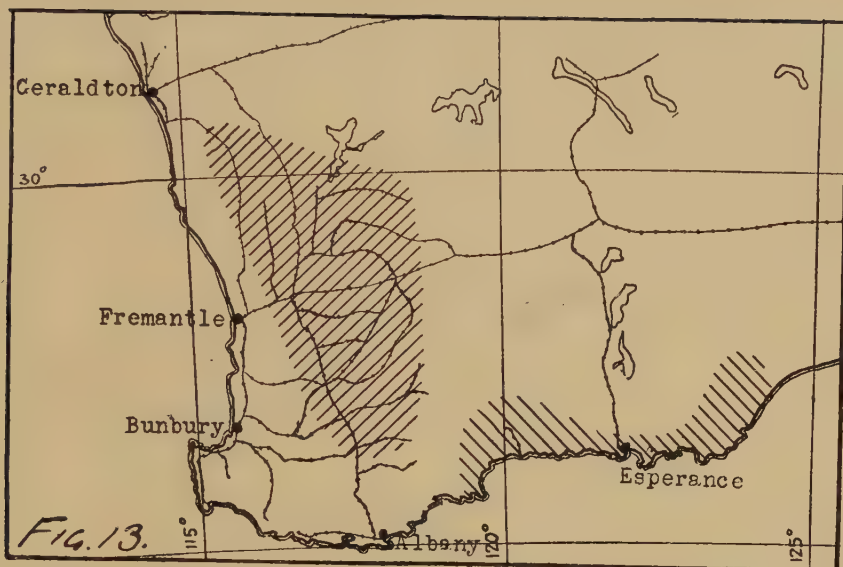
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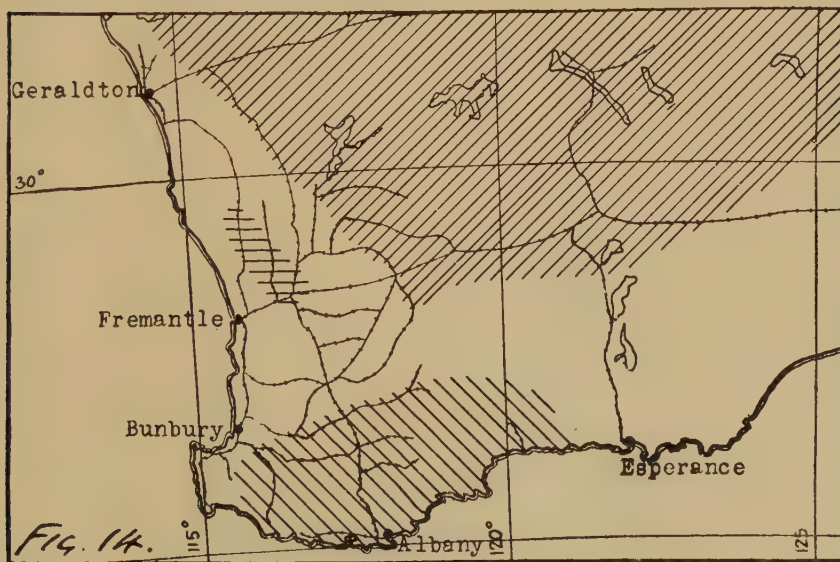




CLUSTER POISON (*Gastrolobium Bennettsianum* C. A. Gardn.)



MT. RAGGED POISON (*Gastrolobium pycnostachyum* Benth.)



HOOK-POINT POISON (*Gastrolobium hamulosum* Meissn.)



PITURI (*Duboisia Hopwoodii* (F. Muell.) F. Muell.)

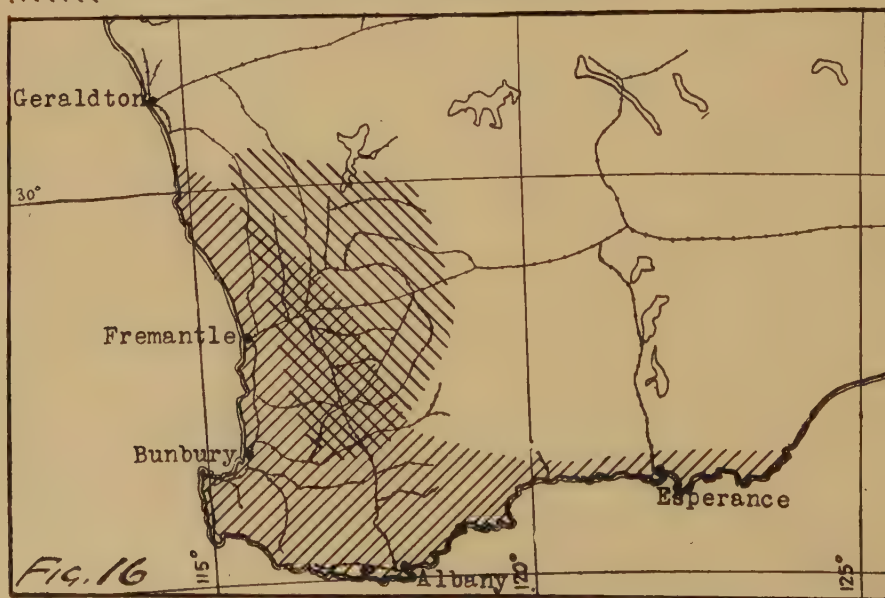


CLOVER-LEAVED POISON (*Goodia lotifolia* Salisb.)



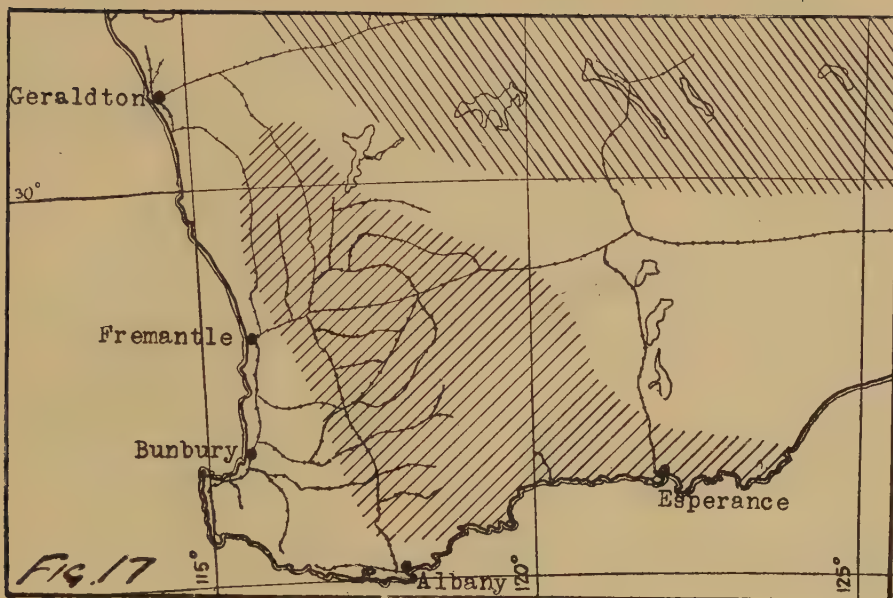

 KITE-LEAVED POISON (*Gastrolobium Laytonii* J. White)


 LAMB POISON (*Isotropis Drummondii* Meisn.)



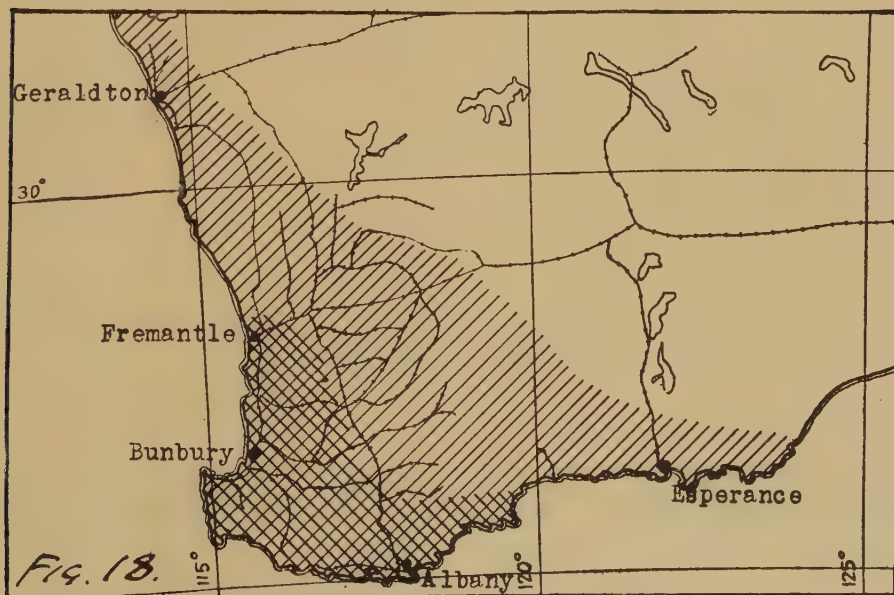

 LAMB POISON (*Isotropis cuneifolia* (Sm.) Domin)


 LAMB POISON (*Isotropis juncea* Turcz.)



BOX POISON (*Oxylobium parviflorum* Benth.)

NATIVE FUCHSIA (*Eremophila maculata* F. Muell.)

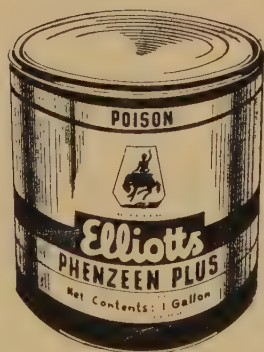


BLIND GRASS (*Stypandra imbricata* R. Br.)

BLIND GRASS (*Stypandra grandiflora* Lindl.)

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# POISON *Plants* OF WESTERN AUSTRALIA

by C. A. GARDNER,

(Government Botanist) and H. W. BENNETTS, D.V.Sc. (Principal, Animal Health and Nutrition Laboratories)

## THE CAPE TULIP (*Homeria species*)

**F**OR countless ages the flora of Western Australia remained as a separate entity undisturbed by plant intruders, but following upon the arrival of the white man came a number of plants, some of which proved able colonists. These included useful plants such as the naturalised clovers; others such as the Cape weed developed here to an extent not to be observed in their natural home. Some of the plants now regarded as troublesome weeds were accidentally introduced by various agencies, while others were deliberately imported, but have since become widespread.

Viper's Bugloss, better known as Paterson's Curse, was originally introduced as a garden flower, while that troublesome pest, the "double-gee," is said to have been known as "Cape spinach," and was brought here to be used as a vegetable.

There were many other plants which were originally introduced to adorn the gardens of the early settlers. At first they were valued but later thrived so plentifully that they were neglected and finally cast out of the gardens but continued to reproduce themselves throughout the countryside.

Many of these plants have corms or bulbs and a number of these, especially those of the Iris family of Mediterranean or South African origin have become troublesome weeds under local conditions.

Among these we must number the Cape "tulps" or tulips. There is a story that the Cape tulip was introduced to this State by Sir Ferdinand

Mueller, then Government Botanist of Victoria, who distributed the plant to various people who collected specimens for the Victorian National Herbarium.

Among his collectors was Miss Julia Sewell, of York, and it is said that while at Youndegin, about 1870, she received seeds from "the Baron" and planted them at York. If this story be true it is not difficult to account for the early abundance of Cape tulip in the York district long before it became common in the metropolitan area.

Since the Cape tulip has become widespread in the South-West in many spots which have proved suitable for its growth, principally the low-lying sandy areas and alluvial clay soils farther inland. Today it is among our most serious weeds, triply endowed for its perpetuation by corms, by bulbils and by seeds.

In addition the plants are toxic, but losses are not common because stock do not appear to relish the plant when



A to I—ONE-LEAVED CAPE TULIP (*Homeria Breyniana* (L.) Lewis); A and B—Habit; C. and D—Corms (D in section showing development of lateral corm); E—Flower; F—Flower in lateral view; G—Ovary, stamens and styles; H—Fruit (capsule); I—Seeds (much enlarged).  
K to L—TWO-LEAVED CAPE TULIP (*Homeria miniata* Sweet); K—Habit; L—Bulbils.  
Metropolitan district.

green, and animals grazed in tulip country are careful to avoid eating toxic quantities. Heavy losses sometimes occur among stock brought down to tulip-infested areas from portions of the State where the plant does not grow. A further source of danger is by poisoning from dried plants which might be included in hay and chaff, for Cape tulip retains its poisonous properties when dried.

### TOXICITY

Of the fifteen species of *Homeria* endemic in South Africa, seven are known to be toxic. Not all of these seven have been examined but an alkaloid *homeridine* has been isolated from *Homeria pallida*, Baker, which has pharmacological actions on the circulation similar to those of digitalis. This alkaloid is said to have no cumulative action. Three species—*H. Breyniana* (L.) Lewis, *H. minitata* Sweet, and probably *H. Lucassii* (L.) Bolus, possess a glucoside which has a digitalis-like action, while *H. aurantiaca* Sweet and *H. bulbifera* of which the toxic principle is unknown, have a digitalis-like action on the heart. *Homeria elegans* Sweet is reputed to be toxic, but apparently has not been tested.

### SYMPTOMS

The corms of *H. Breyniana* eaten by South African natives produced severe nausea, vomiting, weakness, prostration, collapse, slowed and irregular pulse, and mydriasis. Two of four affected natives died about ten hours after having eaten the corms.

The following information regarding "tulip" (tulp) poisoning in South Africa is taken from Steyn's "Toxicology of Plants in South Africa."

All classes of stock are susceptible to "tulip" poisoning when fed with the plant, but under natural conditions cattle, sheep, goats and donkeys are most liable to suffer, whilst horses very seldom or never eat the plant under natural conditions. Tulip is of frequent occurrence on cultivated lands, and serious mortality occurs in stock fed with forage grown on lands where poisonous species of tulip grow. Desiccation has no effect on its toxicity.

Cattle: Non-lethal quantities of tulip cause inappetence, stiffness in the hindlegs, passing of urine at short intervals, abdominal pain, and diarrhoea, the animal recovering after a few days of illness.

It has often happened that transport riders have lost a number of oxen a few hours after they have outspanned and allowed the animals to graze where the tulip is prevalent.

When lethal quantities of tulip have been ingested symptoms commence with abdominal pain, which manifests itself by the groaning of the animal, the grinding of the teeth, looking around at the hindquarters, and by passing small quantities of urine at short intervals. If the animal survives for a time these symptoms are followed by a diarrhoea varying in degree from slightly fluid to bloody. The pulse, which at first is strong and accelerated, later on becomes very weak and even imperceptible. The respiration is superficial and hurried. There is a rise in temperature, which on account of the profuse diarrhoea drops below normal. The animal stands with the back arched and the abdomen "tucked up", and the ears and limbs are cold. Weakness, which is most pronounced in the hindquarters, steadily increases until the patient is unable to rise. Lachrymation and tympany are symptoms often seen in tulip poisoning. The animal walks with a swaying gait. Nervous symptoms, such as muscular twitchings, marked dullness and stertorous breathing, may be present. The animal dies in a state of collapse, passing liquid or blood-stained faeces every few minutes.

The most constant symptoms of tulip poisoning are colic, diarrhoea, tympany, and dullness. Very often the animals exhibit marked thirst, and if they survive for a few days there is a marked loss in condition. When large amounts of tulip have been ingested the animals die within a few hours and before diarrhoea appears.

Horses, mules and donkeys: The symptoms very closely resemble those described for cattle. The symptoms of colic are very severe; pulse and respiration are accelerated and a yellowish-green fluid diarrhoea supervenes. The animals may show icterus due to the swelling and consequent obstruction of the duodenal opening of the bile duct, thus causing stagnation of the bile. This condition may also be found in cattle provided they survive for a few days. The affected animals show an increasing dullness, standing with a drooping head. Weakness progresses and the animals, like cattle, die in a state of collapse.

Sheep and goats: The symptoms of poisoning are identical with those described in cattle.

### POST-MORTEM APPEARANCES

The most common *post-mortem* lesion in acute and subacute cases is an acute gastro-enteritis, which may vary in degree from a slight catarrhal to a marked haemorrhagic. Furthermore, there may be present subepi- and subendocardial haemorrhages, congestion of the brain, hyperaemia and oedema of the lungs, hyperaemia of the kidneys, haemorrhages in the spleen and thymus. In peracute cases death as a rule occurs before the above lesions have developed.

### TREATMENT

The treatment is purely symptomatic. Emollients, demulcents, and astringents counteract the gastrointestinal irritation. As heart stimulants, strong black coffee, alcohol and camphor are indicated, whilst digitalis is contra-indicated. Steyn found potassium permanganate and tannic acid of no value in the treatment of sheep and rabbits suffering from tulip poisoning. These drugs were administered either per os or parenterally.

### DESCRIPTION OF THE PLANTS

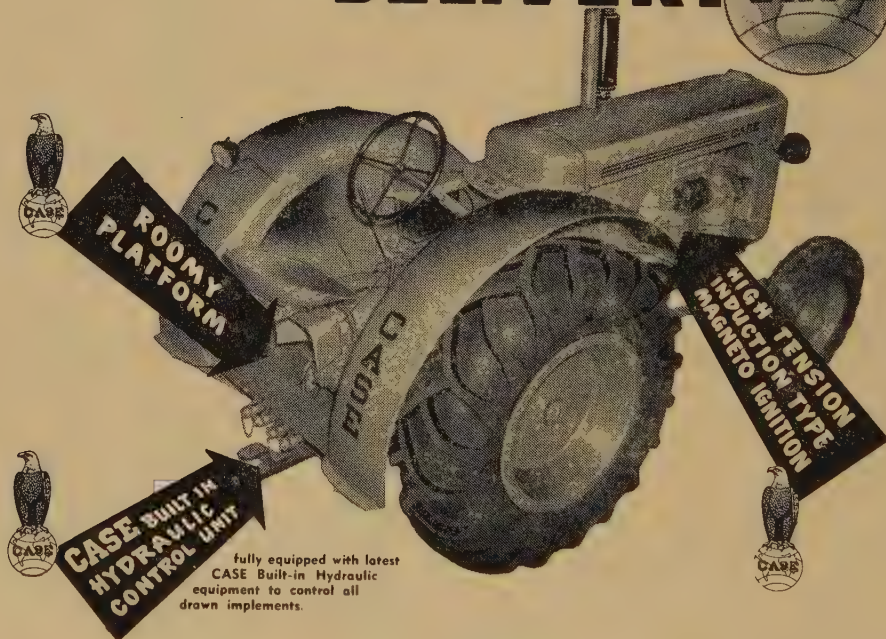
In conjunction with the plate accompanying this article, the following points should serve to distinguish the Cape tulips from other plants of somewhat similar appearance. Both possess corms, which might be termed solid "bulbs". The corm is covered with a

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number of thin fibrous somewhat latticed tunics which fall away in age. The roots are fibrous and rather thin. The exterior of the corm when its fibrous coat is removed, as well as the lower part of the leaf-sheath, is a rich yellow colour below the soil level (this is fairly characteristic). The corms are renewed annually as shown in the plate, and sometimes two corms are formed from one parent corm. Small stalked bulb-like or corm-like bodies known as "bulbils" are formed at the base of the parent corm. Each of these is potentially a corm.

The single stem is erect and enveloped by the sheathing base of the leaf or leaves which are deep green, much elongated, flaccid and prominently ribbed and entirely devoid of hairs or other clothing. The upper part of the stem is occupied by the inflorescence which is branched, each branch arising from a spathe which envelops the base of that branch. Each flower is similarly subtended by a spathe, rather thin and membranous, and soon becoming lacerated at the tip.

The flowers consist of a perianth of six segments or parts—three outer, and three inner—orange to orange-yellow or rarely yellow in colour, with a yellow or pale area at the base of each. The three stamens are placed opposite to

the outer perianth-segments and united in a tube in the lower part, the anthers being long and erect. The style emerges from the staminal tube and has three small petal-like orange-coloured branches which are notched at the summit and papillose on the outer margin. The ovary is inferior, i.e., is placed below the perianth, and resembles somewhat a stalk of the flower. It has three compartments and numerous ovules which ripen into globular seeds usually angled by pressure.

The fruit (mature ovary) is long and narrow, and has a cap-like extremity or operculum, and opens by splitting at the apex only. It is not enclosed in the spathe at maturity. Most species of *Homeria* possess but one leaf. The two naturalised species are the one-leaved Cape tulip (*Homeria Breyniana*) and the two-leaved Cape tulip (*H. miniata*). The latter can be distinguished from the former by the possession of two leaves, in the axils (inner bases) of which numerous stalked bulbils are formed. They are sometimes referred to as "cormlets". *Homeria Breyniana* was formerly known as *H. collina* Vent.

The name *Homeria* is from the Greek *homereo*, having reference to the union of the filaments of the stamens.

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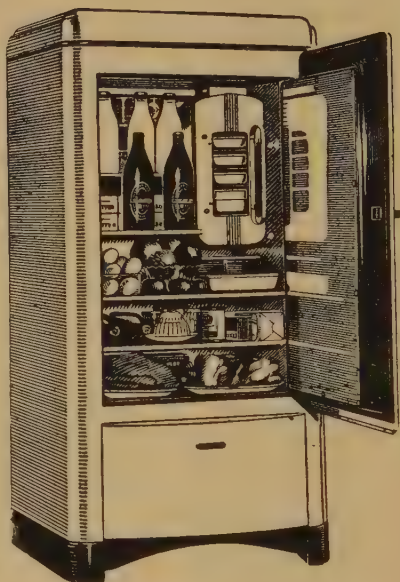
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# Diseases *of* DAIRY CATTLE

## WARTS AND EYE CANCER

By J. CRAIG, M.R.C.V.S., Senior Veterinary Surgeon.

**PAPILLOMA** or warts are by no means uncommon in dairy cattle in Western Australia. In maturing cows, they usually occur on the udder, while in young stock they may be found on the head, neck, and shoulders. In bad cases, a large proportion of the body area may be covered with the warts, forming large cauliflower-like masses which often bleed easily.

The condition is caused by a filterable virus, and animals may be affected through rubbing on affected animals, or by being placed where affected animals have been. Badly affected animals do not thrive, while the warty condition seriously depreciates the value of the hide.

Warts on the teats are infectious and may be transmitted from cow to cow on the hands of the milker. These warts are of many shapes and sizes, and may cover all the teats of the udder. Long slender warts are easily removed with scissors or by tying a silk ligature tightly around their base so that they will slough off in a few days. The roots of such warts should then be treated with caustic potash sticks.

**Treatment.**—Flat warts, which may cover almost the entire udder surface, are sometimes extremely difficult to deal with, and treatment should not be attempted until the cow is dry. Careful perseverance with treatment is necessary. Application of glacial acetic

acid on the end of a match-stick, repeated over a number of days may cause the disappearance of the wart. Salicylic acid (one part), collodion (seven parts) may be painted on once per day with good effect. Salicylic acid (one part), glycerine (three parts) is also used. The use of a silver nitrate stick or caustic potash stick is more efficient, but more dangerous. Similarly, commercial hydrochloric acid may be applied with caution to the exact area of the wart.

In the very early stages of wart formation, the daily application of crude castor oil has been known to check the development in some instances, although several weeks may elapse before a cure is effected. Olive oil smeared thickly over the area between milkings is also recommended.

The internal administration of Fowler's solution of arsenic, 1 tablespoon twice daily for stock 6-12 months old until symptoms of arsenical poisoning begin to appear, is claimed to have a

beneficial effect in some cases. A wart vaccine is in use in America, but no such procedure has been tried out as far as is known in this country.



A Jersey bull carrying large numbers of warts on the head and neck.

### EPITHELIOMA (EYE CANCER)

Epithelioma of the eyes of cattle, more commonly referred to as eye cancer, is a malignant type of tumour which attacks the eye and related tissues.

The specific cause of this condition is not known, but possible contributing factors in the form of dust, sand, insects and other irritants have been suggested. In the case of Hereford cattle, which lack protective pigments in the eye membrane and skin surrounding the eyes, the strong rays of the sun have been mentioned as a possible cause.

The growth may have its origin in the *Membrana nictitans* (third eyelid) at the inner angle of the eye, in the

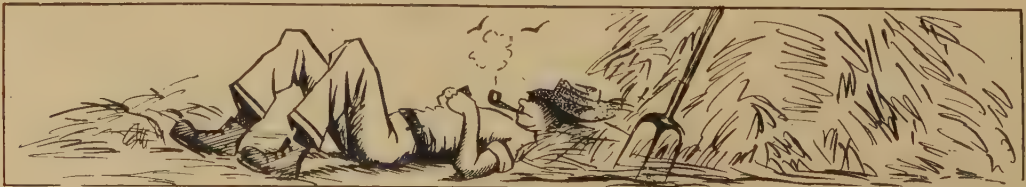
mucous lining of the lids, or in the cornea (front part) of the eyeball. It may first appear as a small reddish mass which, as it becomes larger, assumes an irregular and fungus-like shape. These growths are sensitive and when injured, bleed easily. The eye proper is not at first involved in the early stages, but later when it is affected, the eyesight is destroyed.

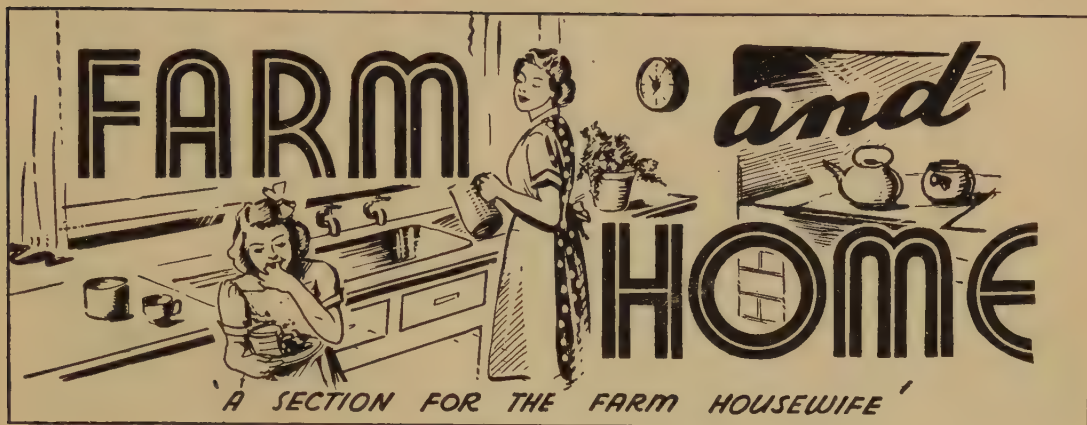
Infection follows rapidly, and with the multiplication of bacteria, there is much pus formation and a foul odour, while in warmer weather these growths may be seen to be infested with maggots. The eye is eventually completely destroyed by the growth, when then spreads to the surrounding subcutaneous tissues and bony structure of the orbit. In very advanced cases, cancerous cells may be distributed via the blood stream to internal bodily organs, while there is a progressive loss of condition.

**Treatment.**—Nothing can be done when the tumour has become extensive enough to involve the entire eye and adjacent structures. In the latter case, should the animal still be in fair condition, it should be sent to the market for slaughter.

Operative procedure consists of the total removal of the cancerous tissue, usually under local anaesthesia. With a well established growth, the total removal (enucleation) of the eyeball would be necessary.

It is therefore extremely important that the operation should be performed as soon as a definite diagnosis has been made. When performed early enough, the results are usually quite satisfactory. Needless to say, such an operative technique would have to be carried out by a veterinary surgeon.





## *Making the most of the Christmas Poultry*

By HELEN M. GLOSTER

**T**HE festive season is now approaching and housewives, far and near, will be planning the dinner which is to surpass all previous Christmas dinners in attractiveness, palatability and originality. Let us try this Christmas to introduce some variety and individuality into the preparation and serving of the traditional poultry.

When choosing poultry remember that the best quality table birds are plump, compact and well-fleshed. This applies both to the traditional turkey and to the smaller breeds of poultry, some of which are more suitable for the table than others. Breeds such as White Leghorn are essentially egg producers rather than table birds and although young birds of this breed may be suitable for a family of two they are liable to be lightly fleshed.

The feet and legs of a young bird are clean, soft and smooth, and the end of the breast-bone is soft and springy when pressed with the fingers.

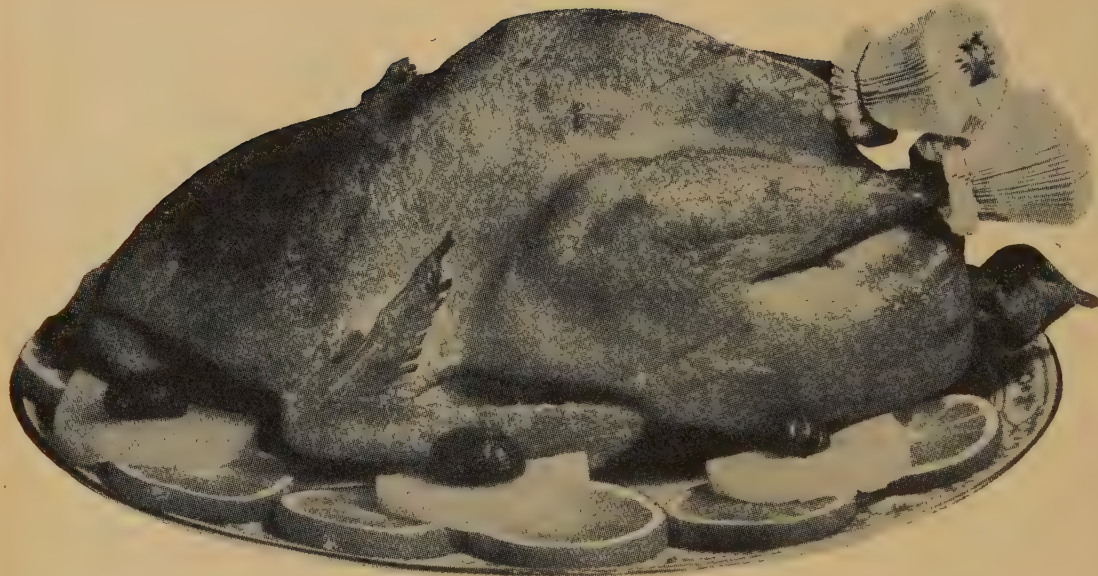
The legs of old birds are usually coarse and scaly, the skin is coarse in texture and the sinews of the legs are strong and hard to remove when pulled. The end of the breast-bone is hard and rigid if pressed with the fingers.

Old birds are invariably tough. Thorough cooking in water or steam is

necessary to make the flesh of these birds reasonably tender but, where younger birds are not available, good results may be obtained by stuffing and baking after a preliminary softening by steaming.

**Preparation.**—After killing and dressing the poultry may be washed, but not soaked. It should then be dried well. Poultry should be killed and dressed the day before it is to be cooked to obtain the best flavour and texture. Do not forget to remove the hairs by singeing the birds before cooking.

**Stuffing Poultry.**—Forcemeat or farce-meat, a common name for stuffing, has its origin in the French word "farcie" meaning to stuff. This word often finds its way on to luncheon and dinner menus. The type of stuffing used should depend on the type of poultry available. Mild-flavoured birds such as chicken and turkey require a mild stuffing while the stronger flavoured



birds such as ducks and geese require stuffing which has a more pronounced flavour such as one that is sharply seasoned or a tart fruit stuffing.

The average housewife is familiar with two types of forcemeats, such as veal stuffing and sage and onion stuffing but unfortunately they are often used indiscriminately regardless of the type of meat for which they are to be used.

Veal stuffing is a good example of a mildly-flavoured forcemeat, and a good general rule is to use this type of stuffing for meat and poultry which is delicate in flavour.

Sage and onion is much stronger in flavour and is apt to be overpowering when used as a flavouring for meats that are delicate in flavour. It is an excellent stuffing however for ducks, geese, some wild game and pork.

Breadcrumbs are the foundation for many forcemeats. To these may be added salt, pepper, herbs, nutmeg and lemon rind. Onion is added where stronger flavouring is needed and other additions may be binding material such as fat, egg or milk; ham and bacon

for chicken turkey and rabbit; chopped oysters for chicken and turkey, or sausages for turkey and rabbit. Apples, celery, prunes and oranges may be introduced into stuffing used for ducks and geese and it should always be remembered that the stuffing should be a means of developing or enhancing the flavour.

The cavity of the bird should not be entirely filled with stuffing as the forcemeat swells during cooking. The opening should be sewn up to keep the baking fat out, and the thread should be removed before serving.

**Hints on Cooking Poultry.**—Always bake poultry slowly at a temperature below browning point and brown up just before serving time. Greased papers placed over the bird until just prior to serving will keep the surface moist and help to prevent over-browning.

Old birds should be steamed before baking, or boiled for two hours then stuffed and baked. Alternatively, they may be boiled braised or cooked in a casserole.

**VEAL STUFFING** (For chicken, turkey, veal or rabbit)

*Ingredients:*

- 4 tablespoonfuls soft breadcrumbs.
- 1 tablespoonful butter, dripping or chopped suet.
- $\frac{1}{2}$  teaspoonful thyme or marjoram.
- 1 dessertspoonful chopped parsley.
- Grated rind  $\frac{1}{2}$  a lemon.
- Grate of nutmeg.
- $\frac{1}{2}$  teaspoonful salt, pepper.

*Method:*

- (1) Rub fat or chopped suet into breadcrumbs.
  - (2) Add other ingredients, mix well.
- N.B.—Soft breadcrumbs are breadcrumbs prepared from a loaf of stale bread.

**OYSTER STUFFING** (For roast fowl)

*Ingredients:*

- 2 cups soft breadcrumbs.
- $\frac{1}{2}$  cup melted fat.
- $\frac{1}{2}$  teaspoonful salt.
- Pepper.
- $\frac{1}{2}$  teaspoonful mixed herbs.
- 1 beaten egg.
- Squeeze lemon juice.
- Equal bulk of oysters.

*Method:*

Mix all ingredients together.

**APPLE AND RAISIN STUFFING** (For ducks or geese)

*Ingredients:*

- $\frac{1}{4}$  cup diced salt pork or bacon.
- $\frac{1}{2}$  cup chopped celery.
- $\frac{1}{2}$  cup chopped onion.
- 4 cups soft breadcrumbs.
- 2 tablespoonfuls sugar.
- 2 tablespoonfuls chopped parsley.
- 3 medium sized tart apples (diced).
- 1 tablespoonful salt (if bacon is salty reduce the amount of salt).
- Pepper.
- $\frac{1}{2}$  cup seeded raisins.

*Method:*

- (1) Fry bacon, remove from pan, fry celery and onions for three minutes.
- (2) Remove vegetables, fry apples. Sprinkle with sugar, fry slowly until glazed.
- (3) Mix all ingredients together. If more liquid is required, add egg and milk.

**SAGE AND ONION STUFFING**

*Ingredients:*

- 4 tablespoonfuls soft breadcrumbs.
- 1 medium sized onion.
- $\frac{1}{2}$  teaspoonful sage.
- $\frac{1}{2}$  teaspoonful salt.
- Pepper.
- $\frac{1}{4}$  teaspoonful thyme or mixed herbs.
- 1 tablespoonful fat.
- 1 teaspoonful parsley (chopped).

*Method:*

- (1) Peel onion, chop finely.
- (2) Mix all ingredients together.

**HAM FORCEMEAT** (For turkey, chicken, veal)

*Ingredients:*

- 2 oz. ham or lean bacon.
- 2 oz. chopped suet or fat.
- 4 oz. soft breadcrumbs.
- 2 teaspoonfuls finely chopped parsley.
- $\frac{1}{2}$  teaspoonful mixed herbs.
- Grated rind of half lemon.
- Pinch of nutmeg.
- Pinch mace.
- Salt, pepper.
- 1 egg, a little milk for binding.

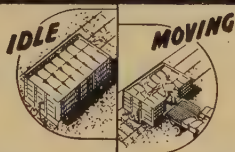
*Method:*

- (1) Chop ham and suet finely.
- (2) Mix all dry ingredients together.
- (3) Add moisture.

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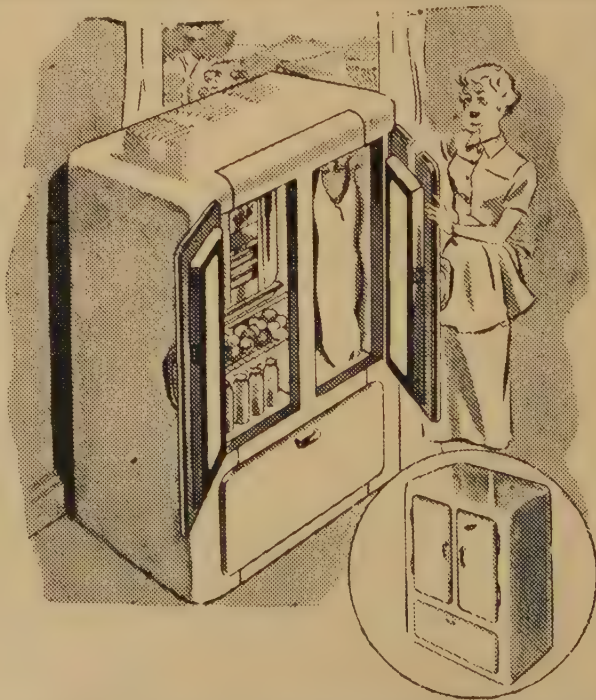
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## SAUSAGE STUFFING (For turkey)

### *Ingredients:*

- 2 lb. pork sausages.
- 4 tablespoonfuls soft breadcrumbs.
- $\frac{1}{2}$  teaspoonful mixed herbs.
- $\frac{1}{2}$  teaspoonful sage.
- 1 teaspoonful salt.
- Turkey liver (finely chopped).
- Milk to mix.

### *Method:*

- (1) Remove skin from sausages.
- (2) Mix thoroughly with dry ingredients.
- (3) Moisten with very little milk.

N.B.—Whole sausages or pieces of bacon may be added to any poultry when stuffing in addition to the forcemeat.

## APPLE STUFFING (For geese and pork)

### *Ingredients:*

- 5 apples (tart apples).
- A little water.
- 1 oz. butter or margarine.
- Grate of nutmeg.
- $\frac{1}{4}$  lb. soft breadcrumbs.
- 2 tablespoonfuls sugar.
- One egg.

### *Method:*

- (1) Peel, core and cut up apples.
- (2) Put in saucepan with fat and small quantity of water. Stew slowly until apples are soft but *not* broken.
- (3) Add sugar and nutmeg, then allow to cool.
- (4) Stir in breadcrumbs, then the well beaten egg.

## MUSHROOM STUFFING

### *Ingredients:*

- $\frac{1}{4}$  lb. mushrooms.
- $\frac{1}{4}$  lb. soft breadcrumbs.
- 1 oz. butter or margarine.
- 1 egg.
- Pinch mace.
- Salt, pepper.

### *Method:*

- (1) Prepare mushrooms, chop them up.
- (2) Melt fat and fry mushrooms gently about five minutes.
- (3) Cool and add all dry ingredients. Mix well.
- (4) Add well beaten egg.

## POTATO STUFFING

### *Ingredients:*

- 1 lb. old potatoes (cooked).
- 2 oz. fat.
- 1 onion.
- Salt, pepper.
- 1 egg.

### *Method:*

- (1) Mash potatoes. They should be dry and floury.
- (2) Melt fat, add onion finely chopped and fry gently for five minutes.
- (3) Add all ingredients to potato. Mix well.

## CELERY STUFFING

Add one cup of finely chopped celery to the potato stuffing.

## APPLE AND PRUNE STUFFING (For roast duck)

### *Ingredients:*

- 3 or 4 tart apples.
- 1 doz. prunes.
- 2 or 3 rashers bacon.

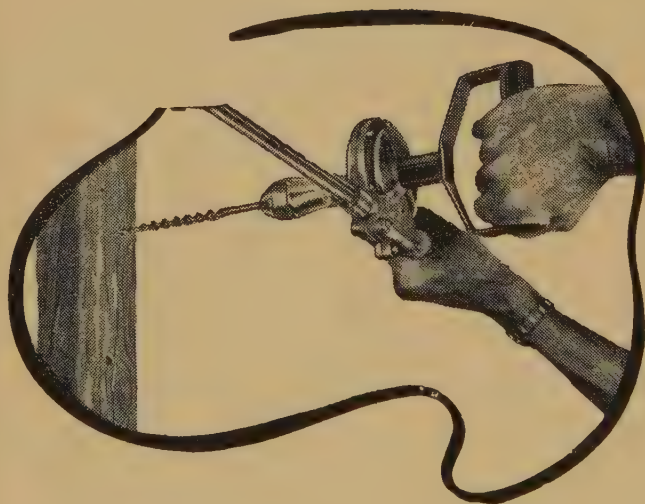
### *Method:*

- (1) Soak prunes, remove stones and cut up.
- (2) Peel and core apples, cut into small sections.
- (3) Cut bacon into small pieces. Mix all ingredients together.

N.B.—Bacon may be omitted.

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## ACCOMPANIMENTS

Brown gravy and various sauces are usually served with roast poultry.

### BREAD SAUCE (With roast fowl or game)

#### *Ingredients:*

- $\frac{1}{2}$  pint milk.
- 2 oz. soft breadcrumbs.
- $\frac{1}{2}$  small white onion.
- 2 or 3 cloves.
- 1 oz. butter or 1 tablespoonful cream.
- Salt, white pepper.
- Pinch cayenne pepper.

#### *Method:*

- (1) Stick the onion with cloves, then place in a saucepan with the milk.
- (2) Heat milk slowly and simmer gently until milk is well flavoured.
- (3) Remove onion, sprinkle in breadcrumbs.
- (4) Heat gently over fire until breadcrumbs swell and sauce is thickened.
- (5) Add seasoning. Serve hot.

### ORANGE SAUCE (Serve with poultry or game)

#### *Ingredients:*

- $\frac{1}{2}$  pint white stock.
- 3 tablespoonfuls chopped celery.
- Grated rind one orange.
- Juice 2 oranges.
- 1 bay leaf.
- 2 yolks eggs.
- Small knob butter or margarine.
- 1 tablespoonful cream.

#### *Method:*

- (1) Using a double saucepan, heat stock, celery, orange rind and bay leaf. Simmer 15 minutes, then strain.
- (2) Return to saucepan, add orange juice.
- (3) Bring to simmering point again.

- (4) Beat yolks of egg and cream. *Slowly* stir in heated liquid.
- (5) Return to saucepan, stir at gentle heat until thickened. Stir in butter just before serving.

N.B.—Be very careful not to over-heat or over-cook sauce after egg and cream are added.

### APPLE SAUCE (For roast duck, goose, pork)

#### *Ingredients:*

- 1 lb. apples (green).
- $1\frac{1}{2}$  tablespoonfuls sugar (or to taste).
- 1 dessertspoonful butter.
- A little water, squeeze lemon juice.
- Pinch salt.

#### *Method:*

- (1) Peel, core and cut up apples.
- (2) Put all ingredients in a saucepan, stew until tender.
- (3) Rub through a sieve or mash well. Add more sugar if necessary. Repeat.

N.B.—Nutmeg and cayenne pepper may be added.

## GARNISHING AND SERVING

Christmas Day is one of those occasions when special efforts are made to serve the meal attractively and the joint or poultry is carved at the table with the family all seated around. The cook will endeavour to garnish the dish to make the poultry look like food photographed for a woman's magazine.

Here are a few suggestions for garnishing:—

Little sticks of potato, not much larger than matchsticks, deep fried and placed in neatly arranged piles around the meat dish.

Potato croquettes (little balls of mashed potato, dipped in egg and dry breadcrumbs.)

Saratoga potatoes—very thin slices of potato fried until crisp.

Sprigs of watercress interspersed between the potato.

Lettuce, broken in the fingers and placed around the dish may take the place of watercress.

Small fried sausages and little rolls of grilled bacon may be served with roast turkey.

Parsley or cress will make an attractive colour contrast with the garnish.

See that all serving dishes are heated thoroughly, poultry and baked vegetables are well browned.

Vegetables should be served in vegetable or pyrex dishes. All sauces should be thoroughly hot and served in sauce tureens or small jugs.

Brown gravy is served in a gravy-boat or jug.

All that remains now to be done is to sit down and enjoy the meal at leisure.

---

## Summer Handbag in White or Cream Cotton

---

**W**HITE handbags are luxury items for they soil easily and leather or other materials soon lose their attractive new appearance when cleaned. Have you ever thought of knitting or crocheting your handbags? They are simple to make and will stand frequent washing and boiling.

The bag in the photo was made with cream cotton twine (eight 1oz. balls) but macrame twine or netting twine will do equally as well. Netting twine (18-ply) is bought in 1lb. hanks in shops which deal in sporting goods or fishing gear.

Next time you go on a long bus or train journey, just arm yourself with the requisite materials and at the end of the trip you will arrive with a brand new handbag. If preferred, the bag may be made in coloured macrame to match your summer frock.

### MATERIALS REQUIRED

About 8oz. of twine or fine macrame.  
One No. 12 Aero Crochet hook.

A piece of lining material 8in. x 8in.

A piece of stiffening material or thin strawboard 7½in. x 7½in. (The cardboard from the back of a writing pad will do if stiffening material is unobtainable.) Sparterie lino, buckram or any hat interlining make good stiffening.

### Directions.

Make four chain stitches, then close the loop with a single crochet.

*First row*—Make two chain to form the first upright stitch, seven treble crochet over the chain ring. Close the row with a single crochet. Draw the loose end of twine firmly to close the commencing ring.

*Second row*—Make two chain to form the first upright stitch, three treble into the same space of previous row. x One treble into next space, four treble into next space x repeat x to x twice. One treble into next space, close row with a single crochet. Work at this stage should form a square, with four well defined corners. There should be four treble crochet at each corner and one treble between each corner.

*Third row*—Make two chain to form the first upright stitch then one treble into each space of previous row. Make four treble stitches at each corner. Close the ring with a single crochet when row is completed.

Continue in this fashion, with four treble crochet at each corner until work measures  $7\frac{1}{2}$  in. x  $7\frac{1}{2}$  in. The base of the bag is now completed.

#### Sides of Bag.

This is done with one treble crochet into each space of previous row. Commence with two chain to make upright. Note only one treble crochet is made into space at each corner from now on.

Continue, row after row until sides measure 6 in. from base, or length desired.

*Next row* — Make two chain to form an upright stitch then make one treble crochet into each of the next five spaces of previous row. Make one chain, miss one space, x one treble into next space. Make one chain, miss one space, one treble into each of next six spaces, one chain miss one space x. Repeat x to x until row is completed. Close the ring. This row forms the holes for threading through the draw-string handle. You may find the last number of upright stitches greater or less than six. Do two rows of one treble into each space of previous row. When last row



is completed taper off by making one double crochet into each of next four spaces, then one single crochet.

Cut twine, thread with darning needle and end off neatly.

#### Draw String Handle.

Make a chain  $1\frac{1}{2}$  yards long. Do one or two rows of double crochet the length of the chain. End off. Thread the draw string through the allotted spaces on the top of handbag. Thread draw string through a second time, then sew the ends of draw string together. Pull up the draw strings. The loops form the handles.



### To Line the Base.

1. Take the 8in. square of material and machine a very narrow hem on one side.

2. Turn in the material until it measures  $7\frac{1}{2}$ in. x  $7\frac{1}{2}$ in. or the exact size of the base of the bag.

3. Machine lining on to the inside of base, leaving the hemmed side unstitched.

4. Slip in the interlining. Your new summer handbag is now ready for use.

N.B.—When washing handbag, always remove the interlining from base of bag.

---

## Try Veal for Variety

**W**HEN trying to introduce a little variety into the menu, remember that a veal dish is both inexpensive and tasty. Most of the menfolk will enjoy this Veal en Casserole.

### Ingredients:

- 1 lb. fleshy veal.
- 1 or 2 rashers of bacon.
- $\frac{1}{2}$  a small onion or 2 shallots.
- A little grated nutmeg.
- Grated rind of lemon (about  $\frac{1}{4}$ ).
- 1 teaspoonful salt.
- Pepper.
- 1 tablespoonful flour.
- A little cold water.

### Method:

- (1) Cut veal and bacon into serving portions.
- (2) Add flavourings and seasoning to flour, then coat veal in seasoned flour.

(3) Dice onion or shallots.

(4) Place all ingredients in a casserole and barely cover with cold water.

(5) Cook gently in oven or in saucepan on top of stove for  $1\frac{1}{2}$  hours.

(6) Serve with spinach and mashed potatoes.

N.B.—Cheaper cuts of veal may be used. When cheaper cuts are used, cut the veal into small pieces and allow longer cooking.

## TO CLEAN SILVER

**S**ILVER cleaning is always a problem. In consequence, the housewife is ever on the lookout for simpler and easier methods of keeping the silver bright and shining.

Have you ever tried this method:—

After washing, place the spoons and forks in a large aluminium saucepan. Cover silver with water and add some soap. (Those small scrap pieces at the end of the cake will do.) Bring water to the boil and boil for a few minutes.

Remove silver from soapy water, dry immediately, and polish. Soapy water may be used for washing the dishes.

The resultant blackening of the saucepan will not harm it. Shine will be restored if apple peelings are boiled in the saucepan.

# A SIMPLE AND EFFECTIVE COW-BAIL

By L. C. SNOOK, D.Sc., B.Sc. (Agric.), Animal Nutrition Officer

**W**HILE visiting the property of Mr. R. Burke, Cowaramup, I saw in use a type of cow-bail which made an immediate appeal because of its simplicity, effectiveness and ease of working. Mr. Burke is obviously skilled at setting up practical time-saving devices but there seems to be no reason why other dairy farmers should not make use of the principle he employed.

Construction is straightforward, and even in these days of material shortages, the timber required is available on most dairy farms. The bail is particularly adapted for use either in milking sheds or in a crush where it would be particularly useful to hold cattle for dehorning or other operations.

The diagram will explain the setup. The moving upright (A) is held in the open position (shown by dotted lines) by a rope passing through a hole in the top of the upright, thence over a suitably-placed pulley to a position in rear of the animal where it is hooked on a convenient bolt or peg. This rope is released when the cow enters the bail, permitting the upright to fall by its own weight to the position shown in the sketch. It falls in a flash and holds the animal without any need for the worker to move forward in order to remove and replace the pin generally used in the orthodox bail.

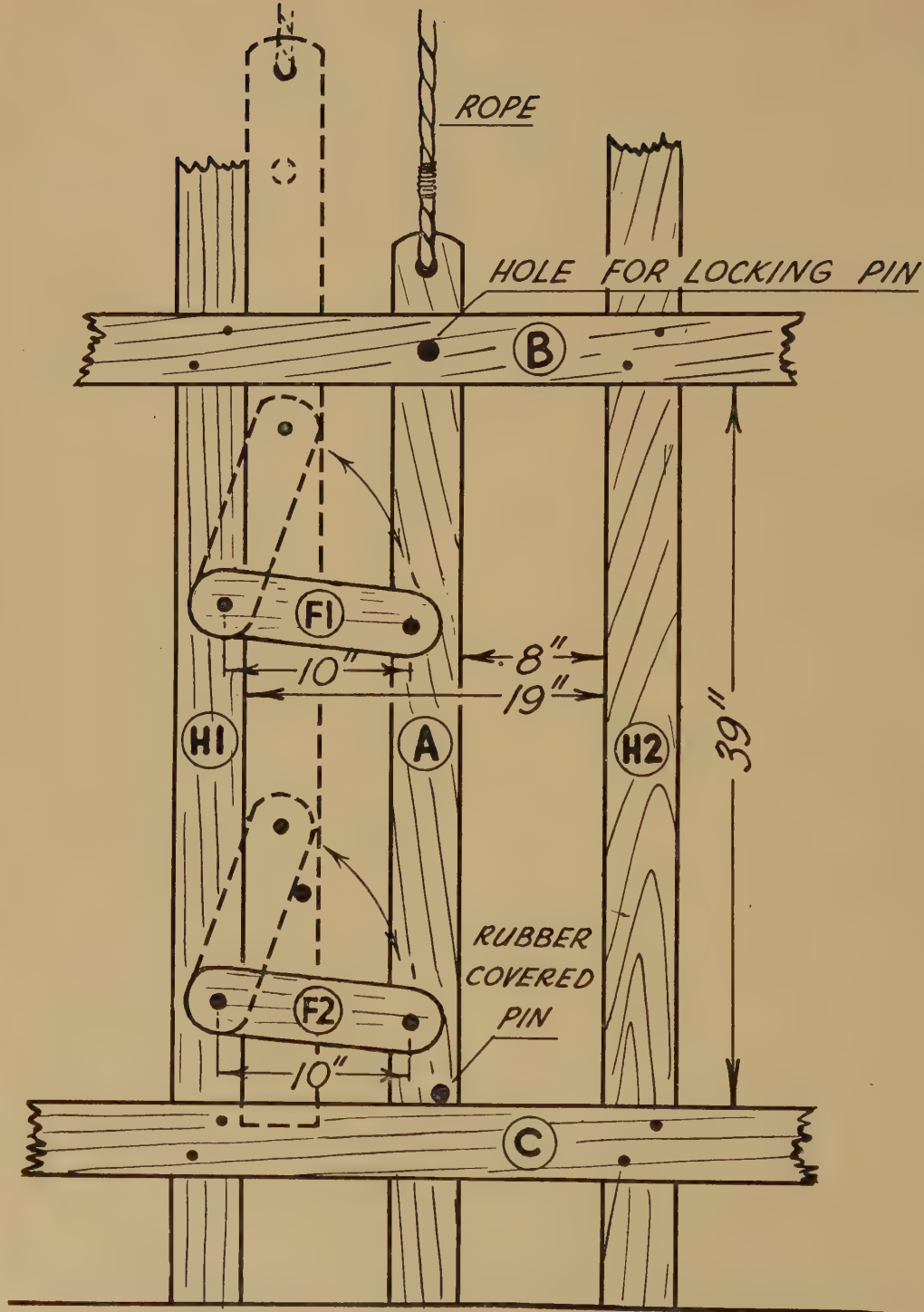
The animal cannot force the upright back because the crosspieces (F1) and (F2) are allowed to drop about one inch below the horizontal at the ends which are attached to the upright (A). The animal in the bail can only push sideways and no amount of lateral pressure will budge the bar. As soon as the worker pulls the rope, however, the bail opens easily and almost automatically. In no case did I see a cow lift the bar

sufficiently to allow the bail to open. When dehorning, or handling unruly cattle a locking-pin could be used if desired by putting it through the hole in the top crossbar (B).

The important feature of the bail is the rubber-covered pin near the foot of the moveable upright. The position of this pin is vitally important as it determines the position of the crossbars (F1) and (F2) when they come to rest in the closed position. As previously mentioned, the ends of the crossbars which are attached to the moveable upright should be about an inch lower than the other ends. Old milking tube rubber was used to cover the pin at both sides in order to muffle the noise of the bail dropping into position.

The main advantage of this bail is that shutting and opening is all done from a position behind the animal. This brings about a saving in time and avoids all the annoyance which inevitably occurs when a cow withdraws its head just as the dairyman moves forward to adjust the commonly-used falling bar and pin.

The main uprights (H1) and (H2) may be constructed from bush timber or any suitable sawn timber which is available. The main crossbars (B) and (C) are checked into the uprights and are each duplicated by a similar bar at the back



of the main upright. They also should be checked in to leave a space of about two inches between each set of bars so that the moveable upright (A) can slide up and down freely. A space of 19 inches is left between the main uprights, (H1) and (H2), and the cross-bars (B) and (C) are 39 inches apart. With the moveable upright in the closed

position there is a space of eight inches between it and (H2). The moveable crossbars (F1) and (F2) should have a space of 10 inches between the bolt-holes, and (F1) should be about 12 inches down from the crossbar (B) so that it does not foul the top bar when the upright is raised to the open position.

---

## SHEEP DIPPING

The dipping of all sheep in the South-West Division of the State, as well as in the Dundas, Esperance and Westonia road districts and those portions of the Merredin, Naremben, Lake Grace and Phillips River road districts situated east of the No. 1 Rabbit Proof Fence is compulsory, and is required to be carried out within six weeks of the date of shearing.

Within 14 days of the completion of dipping a statutory declaration setting out the particulars, is required to be furnished to the Chief Inspector of Stock.

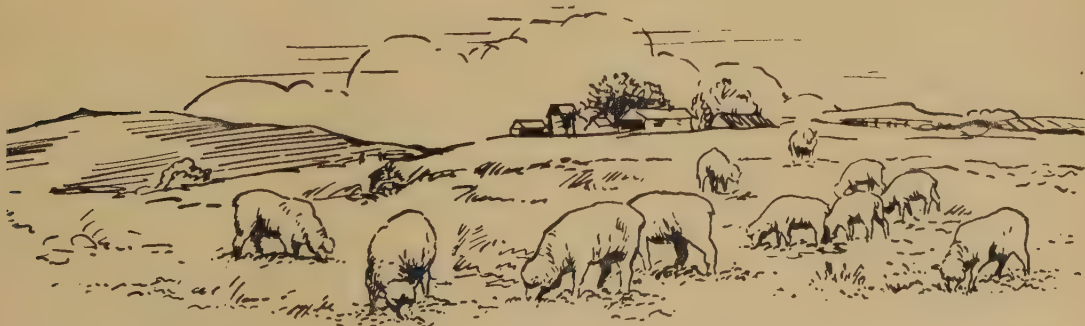
In addition any sheep intended for sale off-shears whether privately or by auction, must be dipped before removal from the owner's property, with the exception that sheep forwarded direct to a meatworks for slaughter within six weeks of shearing are exempted

from this requirement. It is intended to strictly enforce these conditions.

Any undipped sheep offered for sale off-shears whether at Midland Junction or at country markets, and whether or not they are intended for slaughter will be ordered to be withdrawn from sale until they have been dipped to the satisfaction of an inspector.

Similarly sheep found to be infested with vermin will be ordered to be withdrawn from sale and dipped, and in addition the property of the owner will be ordered into quarantine until the shearing and dipping of his flock has been completed.

In addition to dipping, sheep in these southern parts of the State must be wool-branded with the owner's registered wool-brand immediately after shearing.

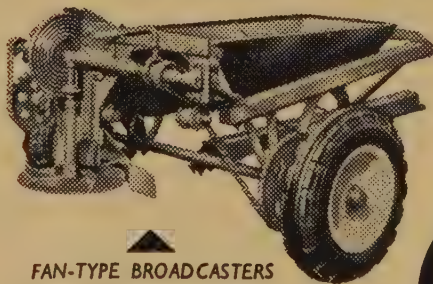


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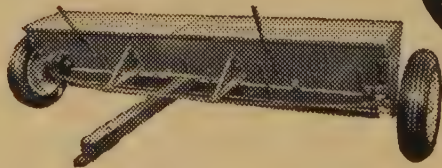


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## REPAIRS TO HARVESTER WHEEL

*Recently we had to dismantle and re-build a Sunshine harvester main wheel. We managed to complete the job fairly satisfactorily but probably a few hints on the correct procedure would have enabled us to do the work with only a fraction of the expenditure of time and labour. Could you publish any notes that might help?*

Thanks to the generous co-operation of the makers of the machine, Messrs. H. V. McKay-Massey-Harris Pty. Ltd., we were able to obtain the following notes and trust that they will be helpful.

### FITTING OF WOODEN RIMS

1. Completely dismantle wheel, including rivetted segment lugs, taking care before doing so to mark the respective locations of the wooden rims and the segment-securing lugs.

2. Remove all burrs from the inside circumference of the steel rim, and inspect the assembly for roundness.

3. Measure with a blacksmith's trammel, or similar tool, the inside circumference of half the steel tyre, i.e., from the point where the original wooden member joined, to the corresponding point directly opposite. Note this dimension, which we shall call "A", carefully.

4. Remove the packing-piece mounted across the diameter of the new wooden rim, and mark off around the outer circumference, dimension "A". It is recommended

that before measuring, a short offcut, say 2in. long, be cut off square at one end of the wooden rim.

5. Fit the wooden half-rim into the steel section, taking care to locate it exactly in the position of the original part, and in line with the markings previously scribed. Draw the wooden member, by means of two or three D-clamps, hard up against the inside of the steel tyre. Secure wood rim temporarily, until such time as all rims are fitted, by boring two or three  $\frac{1}{2}$ in. holes at intervals through the existing grip holes in the steel tyre, and bolt into position.

6. Measure the second half wooden rim, as outlined above, and tap into position. Remember, measurements must be accurate, as the wood rims should hold securely in the tyre before any bolts or spokes are fitted.

Repeat items 5 and 6 on the second pair of wood rims.

7. Bore all holes and mortise the wooden rims for the insertion of the segment-securing lugs. Secure lugs tightly with red-hot rivets.

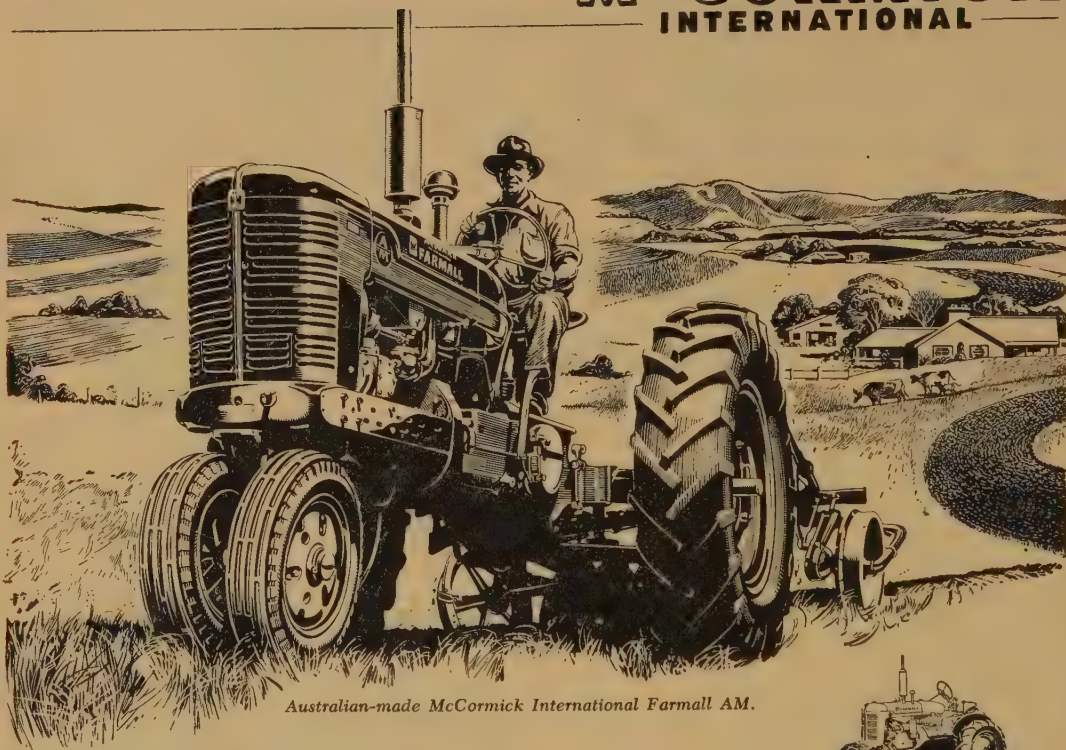
On a 14in. wheel, which embodies two 6in. wide and two 8in. wide wooden rims, the wheel is assembled with the 8in. wide rims to the side of the wheel on which the segment-securing lugs are rivetted.

When repairing a flanged steel wheel, the segment lugs are not removed, but they should be checked and re-rivetted if found at all loose.

### FITTING OF CENTRE

Place wheel rim, segment-side up on a pair of trestles or a suitable frame which will allow for freedom of movement around the wheel and will not foul the wheel centre when it is being placed in position.

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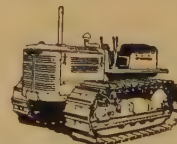
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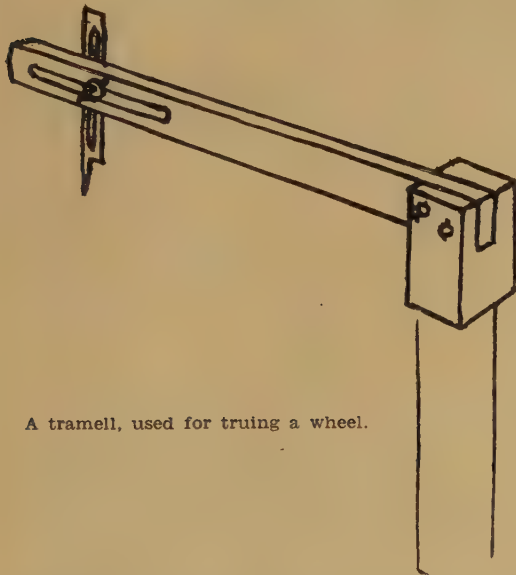
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It is essential that spokes with worn heads be renewed, and that the bore of the wheel centre is in good or new condition.

To fit the wheel centre concentric to the rim, a trammel, as shown in the accompanying sketch, is required. This piece of equipment can be built to suit individual requirements.

There are three nuts on each spoke, which, for the purpose of identification, we will call X, Y, Z.

Nut X is for the purpose of securing the spoke to the rim, and should be tightened



A tramell, used for truing a wheel.

as soon as all spokes are in position, and before any attempt is made to true the wheel.

Nut Y is a lock, and should be left loose until the truing operations of both centre and segment have been completed.

Nut Z, i.e., the nut inside the flange of the centre, and the last to be assembled on the spoke, is for the purpose of truing the wheel.

1. Take a spoke and place it through one of the lower lines of holes in the rim and tighten, then run on second nut (Y), using all available thread.

2. Place centre (with brake-rim down) on the spoke, using the top line of holes in the wheel centre, and hold centre in position by using third nut, Z. Place a second spoke along side the first, using the same line of holes in both centre and rim. The third spoke is assembled in a position on the opposite side of the wheel, using in this case the top line of holes in the rim and the lower line of holes in the centre. As a

guide, nut Z, referred to above, should be screwed on to its full depth. Insert the remainder of the wheel spokes in a similar manner to that outlined above. The wheel should then be trued by the adjustment of the nuts Z until the trammel gauge, when moved in a circle, just touches the rim at all points.

**Note.**—Nut Y should be left loose until such time as both centre and segment have been trued to the rim.

### FITTING OF SEGMENT

Place segment on to the lugs, ensuring that leather packing-pieces are placed between segment and lugs. These packing-pieces should not be more than one-sixteenth of an inch thick.

The trammel gauge should again be used to ensure that the segment is fitted concentric with the wheel centre. If difficulty is experienced then in obtaining concentricity, it is recommended that the segment be rotated one-third or two-thirds of a turn, thus lining up an alternative lug to any one particular segment bolt hole.

### BLOOD IN MILK

*Noticing a red tinge in the separator recently I isolated the suspected cow's milk and allowed it to stand overnight. The cream carried a number of red spots about the size of pin points. No blood was visible during milking. Does this symptom indicate any disease and if so what is the remedy?*

Small quantities of blood in the milk are not uncommon and usually result from the rupture of small capillary blood vessels in the udder. The condition is most common among cows which have calved recently and are yielding heavily. No effective method of treatment can be recommended, but the condition usually disappears as the milk yield declines.

### "BOTTLE JAW"

*Some of my sheep have developed large swellings under the chin, large enough to make feeding difficult. I am told that the trouble is known as "Bottle Jaw" and would welcome advice on this trouble.*

The condition known as "Bottle Jaw" indicates that the animals are suffering from a heavy infestation with Large Stomach Worms (*Haemonchus contortus*).

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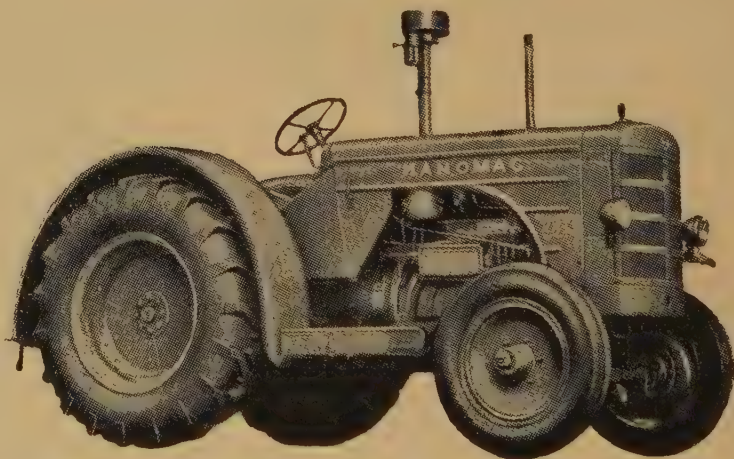
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Drenching with one of the phenothiazine preparations will assist in reducing the worm population and it is suggested that the flock be drenched immediately and the sheep moved to a dry paddock where feed is plentiful. Leaflet No. 679 which may be obtained free of charge from the Department of Agriculture contains full information on worm infestation and treatment.

### IMPACTION

*Recently one of my sheep died and on being opened I found that she was suffering from impaction. Could you tell me what causes this trouble and would linseed oil or spirits of nitre be suitable remedies?*

Deaths from impaction are by no means as common as many farmers imagine. "Impaction" and "dry bible" are often blamed for the deaths of sheep and cattle. On opening up an animal, the "bible" or third stomach is often found to be hard and dry. This is quite a normal condition and many animals which are believed to have died from impaction or "dry bible" in reality died from the condition known as Toxic Paralysis or Botulism.

Linseed oil and spirits of nitre are not usually given to sheep and are unlikely to be of much value in curing the usual ailments encountered in the flock.

### MYCOTIC DERMATITIS

*When I commenced shearing I found that some members of the lamb flock had some sort of disease on their backs. This showed itself by horny patches of wool which made it almost impossible to shear the animals cleanly. It seems to be contagious, as one of the ewes in the same flock is affected very badly. I would be pleased if you could advise me on the cause and cure of this trouble.*

The description suggests that your lambs are affected with Mycotic Dermatitis. This is an infectious disease of the skin caused by a mould or fungus which invades the wool and gives rise to a heaping up of thick scabby material which binds the wool fibres into a hard mass. The condition is largely a disease of young sheep.

The fungus is readily destroyed by a weak solution of copper sulphate (one part to 500 parts of water). Dipping should be carried out during the late autumn. Alternately zinc sulphate solution at the same strength is equally effective.

At shearing time the affected sheep should be shorn last and the lumpy wool should be burnt and the shearing shed and all gear thoroughly cleaned up and disinfected. Fuller information on this disease is contained in Leaflet No. 763, "Mycotic Dermatitis (Lumpy Wool) and Fleece Rot."

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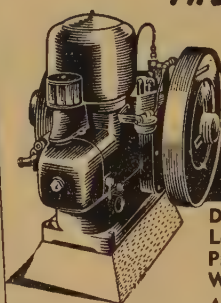
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# WILD DOG INVESTIGATIONS

*The Warburton Ranges Area—July 22 to August 29, 1952*

By A. R. TOMLINSON, Chairman, Agriculture Protection Board,  
and C. K. BLAIR, Vermin Control Officer.

**F**OLLOWING the information gained during the expedition to the north of Nullarbor Plains in 1951, which indicated that dogs were moving along well defined "leads" on to the Plains from the direction of the Warburton Ranges, the Agriculture Protection Board authorised a further expedition by the Vermin Control Branch to endeavour to trace the origin of the migrations. Large sandhills had prevented the Nullarbor Plains expedition from following the "leads" as far north as planned.

It was decided to head from Laverton to the Warburton Ranges and then to travel as far south as possible following any recognisable indications of movements in an attempt to link up with the Nullarbor Plains "leads". At the same time an endeavour was to be made to check on the general wild dog and dingo situation in this remote area and to follow up suspected westerly migration routes from the Warburton Ranges towards Laverton and the pastoral districts to the north. Ear tags were taken for tagging any pups found in order to establish movements.

## PERSONNEL

The party consisted of Mr. C. K. Blair, the Vermin Control Officer in charge of dogging operations in northern areas, Mr. V. R. Lloyd, the Government dogger from the area to the east and north of Laverton, and Mr. A. J. Carlisle, the Government dogger from the Nullarbor Plains. Three native "boys" from the Warburton Ranges Mission Station were attached to the party as guides while the expedition was to the east of the mission.

The party travelled in the special vehicles obtained by the Agriculture Protection Board for these expeditions, consisting of a 4-5 ton International truck to carry supplies and a Willys

jeep for mobility. Mr. Carlisle took his motor cycle for "scouting" purposes. The truck travelled 2,230 miles and the jeep 2,879. No mechanical difficulties were encountered with either vehicle although over 1,000 miles of the travelling was over trackless country. A Traeger transceiver was carried to maintain contact by wireless with the Flying Doctor base at Kalgoorlie.

## ROUTE TRAVERSED

From Laverton the expedition followed the track to the Mission Station. It took six days to traverse the 372 miles with spinifex, sandhills, granite outcrops and rough "breakaways" rendering travelling very slow. Numerous waterholes were located along the track and, as dog signs were seen at practically each one, baits were distributed in the vicinity.

After leaving the Mission, the party travelled easterly to establish a base at Mt. Eveline (35 miles east of the Mission). From here exploratory journeys were made by means of the jeep and the motor cycle to the east, north and south, near Mt. Squires, Mt. Blythe, Mt. Ranford, Barrow Hill and Winburn Rocks. The most easterly point reached near Lightning Rock was 70 miles from the Mission and about 70 miles west of the junction of the South Aus-



— Route taken by  
vehicles.  
--- Explorers tracks.

**JULY - AUGUST 1952.**

# THE 3rd WILD DOG EXPEDITION



Fig. 1.—Unusual rock formations in the "breakaway" country.

tralian and Northern Territory borders. Heavy mulga retarded travelling farther east. The area explored was found to consist of excellent grazing country with saltbush plains, mulga and acacia flats, limestone outcrops and granite, diorite and basalt ranges. Kangaroos, emus, turkeys and rabbits abounded, while old and fresh fox and dingo tracks were plentiful.

The next base was made at "Depot Camp" in the Townsend Ranges and exploratory trips were made, to the south, south-east and south-west. Sandhills prevented travelling farther south than two large "gnamma" holes beyond Table Hill and about 40 miles south-east of the Mission. Numerous old and new dog tracks were seen. "Breakaway" and "open crab hole"

country could be seen extending from the north-west and then south - westerly towards Simpson Hill.

The party travelled northwards through the Mission and up Elder Creek to Granite Springs (20 miles north-west of the Mission) where another base was made. Explorations were made in the jeep to the east and the west. Excellent "crab hole" grazing country with mulga, saltbush, soft spinifex and Flinders grass extended from Elder Creek. Dog tracks were plentiful, while rabbits, emus and kangaroos were seen. "Breakaway" country to the north-west and west towards the Todd Range, Sutherland Range and Lake Gillen, indicated a possible line of movement towards Lake Carnegie and

Lake Wells in the west. Dead mulga prevented any further travelling in this direction.

Through the Mission on the homeward journey the expedition branched south-easterly from Weeljarra Rock Holes to investigate Simpson Hill and Pt. Read, which had been seen from the Townsend Ranges to the north-east. Pt. Read is about seven miles south-east of Simpson Hill which in turn is about 25 miles south-east of the Townsend Ranges. It was confirmed that the line of "breakaway" country through spinifex sandhills from the Townsend Ranges and Table Hill passed through these points and continued as far south-westerly as could be seen through binoculars. The "lead" was bordered by high spinifex sandhills.

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Dog signs, both old and fresh, were observed at all points explored along the "lead" which pointed towards Mound Springs, 120 miles to the south, which is the most northerly point known of the Nullarbor Plains "lead".

Another exploratory trip was made on the return journey from near Lake Throssell to a spring five miles beyond Empress Springs about 40 miles north of the Mission track. A few dog tracks were seen.

Numerous dog tracks were seen along the Mission track all travelling in a westerly direction. Many of the dog signs were over the tyre tracks made on the outward journey. A large number of baits had been taken and several carcasses were found.

### GENERAL OBSERVATIONS

**Wild Dogs and Dingoes:** The observations made showed that a large breeding area exists in the vicinity of the Warburton Ranges extending easterly through excellent grazing country which abounds with game. The easterly limit is not known but indications were that it may reach into South Australia. The natives in the area spend some time hunting, particularly for the pups, which are relished as a tasty meal. The Mission gives food and other goods in exchange for the scalps. Up to 1,547 scalps (including 996 pup scalps) have been received from this area in one year. There is also a steady trickle of dingoes towards the west, south and south-west and apparently occasional mass migrations which might result from poor seasons, overpopulation, or some instinctive desire to travel.

The steady outward movement which was observed this year was occurring despite the fact that local conditions, as far as game and water were concerned were better in the Warburton Ranges than in the west and south. The "leads" observed following country favourable for travelling towards the south, between high spinifex sandhills might be assumed to link up with the

"leads" located into the Nullarbor Plains. However, there is a large gap between the furthestmost points reached by the expeditions and beyond which the sandhills prevented further investigations so it is impossible to be definite on this point.

The suspected westerly "lead" from Granite Springs towards the Todd Ranges and Lake Gillen may link up with a movement of dingoes from the



Fig. 2.—The jeep in scrub country south of the Townsend Range.

east encountered by Dogger Lloyd when he destroyed thirteen dogs in one week in the vicinity of the Ernest Giles Range (a minor breeding area also) which is about 120 miles west and which is a route to Lake Carnegie and Lake Wells.

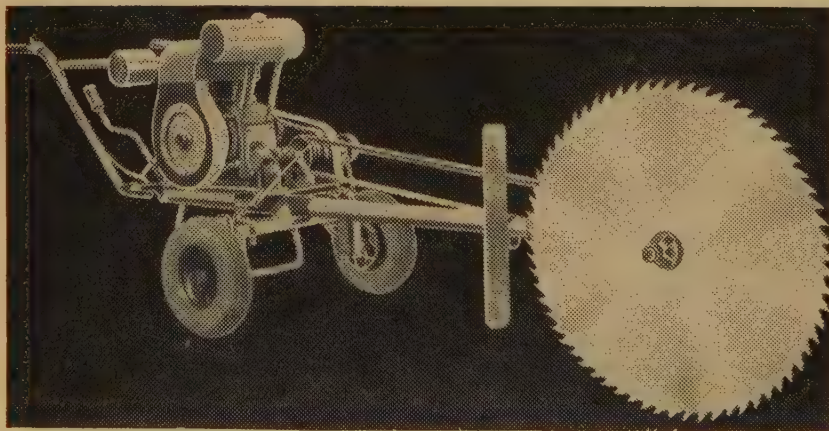
The south-westerly movement towards Lake Throssell and Laverton generally follows the Mission track

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Fig. 3.—Water in the wilderness. The pool at Granite Springs, north of the Warburton Ranges.

which, of course, favours the most suitable country for travelling and passes a number of watering places.

Observations made established the south-westerly movement but the other "leads" have yet to be proved. It was extremely unfortunate that, although many tracks were seen, no live pups were found owing to the inaccessibility of the "dens". As a result it was impossible to carry out ear-tagging which might prove the direction and extent of migrations.

**Rabbits:** Innumerable rabbits were encountered in the favourable country east of the Mission and many warrens were seen. None was observed to the west. It is assumed that the rabbits came from South Australia in the east, although, of course, they may have moved from the south along the suspected "lead". The rabbits would form an easy source of food for dingoes and foxes.

**Foxes:** The steady increase in the numbers of fox scalps coming from this area has been rather puzzling but it has now been explained by the presence of rabbits. Once again this seems to indicate a movement from South Australia.

**Kangaroos and Emus:** To the east of the Mission in the Warburton Ranges, kangaroos and emus were seen in hundreds each day but few were observed near the many soaks and gnamma holes in the more isolated granite outcrops and "break-aways."

Many kangaroos and emus were observed in the settled areas in the vicinity of Mt. Morgans and Yundamindia and to within 70 miles north of Kalgoorlie.

## MEASURES TO BE ADOPTED

The main breeding area is within the reserve for natives which covers part of Western Australia and extends over the border. For this reason, the use of poison baits in the area itself is rather difficult although the opportunity was taken of educating as many natives as possible to the baits. However, arrangements have been made for the doggers concerned to maintain a close watch on the "leads" and to keep them well baited. It will be possible to cover some of the places involved during the aerial baiting campaigns.

## SUMMARY

- (1) An investigation of the dingo and wild dog situation in the Warburton Ranges area was authorised by the Agriculture Protection Board.
- (2) A survey of the breeding areas was to be made and also an attempt to link up outward migrations from the area with inward movements already observed into the south, south-west and east.



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Fig. 4.—A cave which had sheltered a litter of dingo pups.

- (3) A large breeding area was found to the east of the Warburton Ranges extending in the direction of the junction of the South Australian and Northern Territory borders.
- (4) Innumerable kangaroos, emus, turkeys and rabbits were seen in this area and many old and new dingo and fox signs were observed.
- (5) Explorations made to the north and south indicated that some dogs were moving outwards in several directions despite the favourable local conditions.
- (6) A definite "lead" was located on the Mission track along which dogs were travelling from the Warburton Ranges in a south - westerly direction towards Laverton.
- (7) The commencement of a "lead" towards the west was found

north of the Warburton Ranges. This may link up with an influx of dogs into areas well to the west in the vicinity of Lakes Carnegie and Wells and the Ernest Giles Range.

- (8) The commencement of a "lead" towards the south was found. This may link up with the "leads" on to the

Nullarbor Plains discovered in an expedition last year.

- (9) As no live pups were found it was impossible to carry out ear-tagging to observe the direction and extent of migrations.
- (10) There appears to be a steady movement of dogs from the breeding area with occasional mass migrations which may result from dry seasonal conditions, over-population or some instinctive desire to travel.



Fig. 5.—The jeep climbing sandy slopes in the vicinity of the Simpson Hills.

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## WARBURTON RANGES EXPEDITION

### Diary of C. K. Blair—21/7/52 to

30/8/52

July 29.—Left Laverton 11 a.m. for Warburton Ranges. Met Mission truck 30 miles out. Called in at White Cliffs en route. Mileage for day, 50.

July 30.—Camp to Manaule Rock Hole, 1½ miles south of Warburton Road. Laid baits, and inspected two fresh dog tracks. Dugdon R. Hole in granite country. S. F. Hann, E. Talbot and E. Giles carved on rock. Trig. mark PB16. Fresh dog tracks, with pups somewhere in vicinity. Laid baits. Camped Minnie Creek. Mileage, 63.

July 31.—At Minnie Creek. Two fresh dog tracks here and looking for pups all day, walked about 10 miles. Had no luck. Survey trig. HP30 north of Minnie Creek.

August 1.—Travelled along Warburton Road to Terhan Rock Hole. Road very bumpy and slow travelling. Saw only odd sign of dog tracks today. Mileage, 107.

August 2.—Travelled to Windular Rock Hole. Dogs watering here, laid baits. Indications point to pups in vicinity. Road very slow and quite a number of sandhills to cross today. Extensive breakaway country around rock hole. Gahnda Rock Hole. Marked 197 L  $\uparrow$  S 36 Lat, on tree. Mileage, 100.

August 3.—Hunting around breakaways at Windular Rock Hole for pups—no luck. Ideal small breeding areas, poisoned one old dog. Travelled to Weeljarra Rock Hole in afternoon. Mileage, 28.

August 4.—Travelled to junction Elder and Hughes Creeks. Saw numerous dog and fox tracks today. Road very heavy, mostly spinifex sandhills. Bugged in sand at Elder Creek. Took mail to Mission and arranged to pick up three natives as guides. Mileage, 24.

August 5.—Travelled to Mt. Eveline. Excellent travelling today through mostly broken diorite and basalt country with sparse mulga thickets and salt-bush flats. Heavy going last five miles to Weelargn Spring. Evidence of numerous dogs this area, both past and present. Game also fairly plentiful. Kangaroos and rabbits. Mileage, 41.

August 6.—Hunting around ranges towards Mt. Squires. Kangaroos, rabbits, emus, foxes and dogs very plentiful. Saw five dingoes, and shot slut suckling pups, but unable to locate them. An abundance of limestone caves on mulga flats where pups could be. Tracks of dingoes becoming more plentiful towards Barrow Range. Mileage, 37.

August 7.—Travelled 100° to Mt. Squires on Barrow Range. Limestone outcrops and mulga flats with low sandhills bordering range. Saw three dogs vicinity range. Rabbits and foxes plentiful along sandhills. Dog tracks everywhere and saw two today. About 20 natives visited camp today. Mileage, 37.

August 8.—Travelled north to Mt. Elvrie and east to Mt. Elsie. Splendid country and good rains in this area some time previously. Dog tracks numerous, also rabbits, but kangaroos scarce. Had light rain today. Saw native fires north of us today, travelling east. Mileage, 27.

August 9.—Mt. Eveline to depot camp in Townsend Ranges in morning. Took half a day off and climbed peak on range to secure bearings. Saw two dogs including one black. Found pups in cave, but could not get them. Laid baits. Found rock hole in ranges where dogs are watering. Mileage, 37.

August 10.—Went south of depot camp 192° through five miles heavy sandhills before coming to mulga scrub with good crab hole flats, vicinity Table Hill. Numerous old and new dog tracks in evidence. This appears to be the commencement of the south-westerly lead for dogs towards Nullarbor Plains. Country runs some distance south-westerly direction. Game plentiful, and dingoes howled all night. Mileage, 41.

August 11.—South of Table Top Hill then westerly for 10 miles. Spinifex sandhills to the south. Broken country south-westerly towards Simpson Hill. Headed north over heavy sandhills back to-

wards depot camp. Picked up one black dog poisoned at rock hole in range. Natives arrived at camp today. Mileage, 40.

August 12.—Left depot camp north through Mission to Granite Springs. Left three natives. Heavy going up Elder Creek. Splendid country consisting of mulga, saltbush, soft spinifex, crab holes with Flinders grass. Good rains. Again dog tracks becoming plentiful. Did some scrub cutting and digging today. Mileage, 60.

August 13.—Arrived Granite Springs after further road making over ranges and making crossing over creek. Camped on F. Hann's site in 1903. Mileage, 3.

August 14.—Travelled round four gnamma holes in morning and laid baits. Saw one dog. Evidence of dogs still plentiful. Checking truck and jeep in afternoon and securing meat for bait. Saw rabbits, emus and kangaroos which are pretty wild. Mileage, 17.

August 15.—North-west of Granite Springs to Treasure Hills, located four rock holes not marked on map. Also rock hole with names of F. Hann. JMD 5/9/03 on entrance cave. Here indications were located of a westerly lead to Todd Ranges and Mt. Samuel. Broken breakaway country north-westerly, but bordered by large sandhills. Westerly towards Sutherland Ranges also broken country. Mileage, 40.

August 16.—Moved to Weeljarra on Mission Road. Picked up one poisoned slut with pups somewhere. Mileage, 50.

August 17.—Travelled south-east from Weeljarra to Simpson Hill, Pt. Read and Pt. Roberts. Heavy sandhills and spinifex reaching these points thence all broken break-away country running S.S. westerly towards Nullarbor Plain and Lake Yeo areas. Here again evidence of dogs found which linked up our previous findings at Table Hill. Mileage, 42.

August 18.—Two nests of pups were also found here. This now completes the survey of breeding areas and leads both westerly from Granite Springs, S.S. westerly towards the Nullarbor from the Barrow Range country. Weeljarra to Terhan rock hole on Warburton Road. Heavy going—fire under jeep today when exhaust lighted dry spinifex. Found poisoned slut, with pups. Mileage, 130.

August 19.—Terhan rock hole to 20 miles north of Buldger Soak. Bugged in sandhills with truck. Saw two dogs along road today travelling west. Mileage, 59.

August 20.—North of Lake Throssell to five miles beyond Empress Spring. Located spring in break-away country, but only small area surrounded by large sandhills. Heavy going and another fire under jeep today. Only odd tracks of dogs here. Evidently westerly lead 50 miles further north along Lake Gillan and Salt Creek. Mileage, 57.

August 21.—North of Lake Throssell to Minnie Creek. Saw where dogs travelling westerly along road. Saw one, but missed him. No fresh tracks this rock hole. Jeep travelled along edge of Lake Throssell. Mileage, 108.

August 22.—Minnie Creek to four mile well through White Cliffs Station. Checked truck and jeep, changed all oils and greased up. Mileage, 122.

August 23.—Arrived Laverton, reloaded and camped along Linden Road. Mileage, 84.

### SOME INTERESTING INFORMATION GIVEN BY NATIVES ON DINGOES

Some interesting information was secured from the natives in respect to three distinct types of dingoes and the habits of these vary somewhat from each other. The brindle dingo is much sought after as a hunting dog as they claim it is a better killer in attack and will not leave a scent once on it. It frequently lives in limestone blowholes and, when inside, will scratch back and cover the entrance, also partly cover the hole where its pups are. This type is known to them as the "Marru". It is a large dog with heavy jaws and higher forequarters than hindquarters. The white is known as the "Bill-baroo" and resembles the kelpie having a much smaller head and ears and a very bushy tail. The yellow and also the black dingoes are known as "Warragoo", but as far as I could ascertain the habits of the two last mentioned do not vary much.

# STOCK FOODS

The following stock foods have been registered with the Department of Agriculture under the Feeding Stuffs Act, 1928-1951, for the year commencing 1st July, 1952

| Stock Food.                    | Reg. No. | Brand.                         | By whom Registered.                   | Materials from which Made.                                             | Registered Analysis. |            |              |                  |                                              |                               |        |
|--------------------------------|----------|--------------------------------|---------------------------------------|------------------------------------------------------------------------|----------------------|------------|--------------|------------------|----------------------------------------------|-------------------------------|--------|
|                                |          |                                |                                       |                                                                        | Crude Protein.       | Crude Fat. | Crude Fibre. | Sodium Chloride. | Phos. Acid (P <sub>2</sub> O <sub>5</sub> ). | Calcium (Ca).                 | Other. |
|                                |          |                                |                                       |                                                                        | % (Min.)             | % (Max.)   | % (Max.)     | % (Max.)         | % (Max.)                                     | % (Max.)                      | %      |
| <b>A.—SIMPLE FOODS.</b>        |          |                                |                                       |                                                                        |                      |            |              |                  |                                              |                               |        |
| 1.— <i>Meat Meals.</i>         |          |                                |                                       |                                                                        |                      |            |              |                  |                                              |                               |        |
| Whale Meal                     | 2        | N.W.W.                         | Nor'-West Whaling Co., Ltd.           | Whale carcase                                                          | 52.0                 | 8.0        | 1.0          | { 0.4<br>0.2*    | { 13.0<br>9.0*<br>4.0*                       | { 12.0<br>8.0*<br>3.5*        | ...    |
| Meat Meal                      | 7        | MIDLAND                        | State Abattoirs, Midland Junction     | Animal offal and residues                                              | 52.0                 | 15.0       | 2.0          | ...              | ...                                          | ...                           | ...    |
| Do.                            | 12       | COOGEE                         | Anchorage Butchers Pty., Ltd.         | Waste meat products                                                    | 36.9                 | 18.6       | 1.3          | 1.0              | 12.73                                        | { 12.5<br>8.0*<br>9.5<br>7.5* | ...    |
| Whale Meal                     | 43       | AUSTRALIAN WHALING COMMISSION  | Australian Whaling Commission         | Whale carcase                                                          | 55.0                 | 10.0       | 1.0          | { 0.6<br>0.3*    | { 10.5<br>8.5*                               | ...                           | ...    |
| Meat Meal                      | 44       | W.A.M.E.                       | The West Australian Meat Export Works | Meat, bone and blood                                                   | 45.0                 | 13.0       | 2.0          | ...              | 12.0                                         | 11.0                          | ...    |
| <b>2.—Meat and Bone Meals.</b> |          |                                |                                       |                                                                        |                      |            |              |                  |                                              |                               |        |
| Meat and Bone Meal             | 9        | PENNELL'S                      | C. A. Kirkby & Sons                   | Meat and bones                                                         | 50.0                 | 12.0       | 4.0          | { 1.2<br>0.5*    | { 14.0<br>10.0*<br>15.2                      | 12.0*                         | ...    |
| Bone and Meat Meal             | 20       | KITCHEN'S                      | J. Kitchen & Sons Pty., Ltd.          | Animal fat and bone                                                    | 40.0                 | 10.0       | 1.5          | 1.5              | { 13.0*<br>15.0<br>15.0                      | { 11.0*<br>15.0<br>15.0       | ...    |
| 40% Protein Meat and Bone Meal | 25       | THOMAS                         | W. Thomas & Co. (W.A.), Ltd.          | Meat and bone meals                                                    | 40.0                 | 12.0       | 3.0          | { 1.5<br>1.2*    | { 5.0*<br>5.0*                               | 5.0*                          | ...    |
| Meat and Bone Meal             | 53       | TB & S in dis-<br>mond, ALBANY | T. Borthwick & Sons (Aust.), Ltd.     | Animal offals                                                          | 40.0                 | 17.0       | 4.0          | 1.0              | { 12.0<br>8.0*                               | { 10.0<br>7.0*                | ...    |
| Do.                            | 54       | TB & S in dis-<br>mond, ALBANY | do. do.                               | do.                                                                    | 50.0                 | 20.0       | 4.0          | 1.0              | { 9.0<br>2.0*                                | { 8.0<br>1.0*                 | ...    |
| Protein Meat and Bone Meal     | 55       | CHAMPION                       | Sims, Cooper (F.W.) Pty., Ltd.        | Meat Works offal                                                       | 50.0                 | 18.0       | 5.0          | 0.18*            | 9.56*                                        | 9.1*                          | ...    |
| Do.                            | 111      | IMPERIAL                       | W. Angliss & Co. (Aust.) Pty., Ltd.   | Meat and bone                                                          | 50.0                 | 14.0       | 2.0          | ...              | ...                                          | ...                           | ...    |
| Whale Meal and Bone Meal       | 117      | APEX                           | E. J. Fry Pty., Ltd.                  | Whale offal                                                            | 17.5                 | 7.0        | 5.0          | ...              | { 30.0<br>20.0*                              | { 25.0<br>15.0*               | ...    |
| Meat and Bone Meal             | 120      | ABERDEEN                       | W. R. & N. N. Clarke                  | Meat and bone                                                          | 50.0                 | 13.0       | 2.0          | ...              | ...                                          | ...                           | ...    |
| Do.                            | 121      | S.M.P.                         | do.                                   | do.                                                                    | 50.0                 | 13.0       | 2.0          | ...              | ...                                          | ...                           | ...    |
| Do.                            | 136      | SAYER                          | Penn Boucant Pty., Ltd.               | do.                                                                    | 45.0                 | 13.0       | 2.0          | ...              | ...                                          | ...                           | ...    |
| Feeding Meat and Bone Meal     | 137      | PANNIFEX                       | Burridge & Warren Pty., Ltd.          | do.                                                                    | 45.0                 | 13.0       | 5.0          | ...              | ...                                          | ...                           | ...    |
| <b>3.—Liver Meals.</b>         |          |                                |                                       |                                                                        |                      |            |              |                  |                                              |                               |        |
| Liver Meal                     | 112      | IMPERIAL                       | W. Angliss & Co. (Aust.), Pty., Ltd.  | Livers                                                                 | 85.0                 | 19.0       | 1.0          | ...              | ...                                          | ...                           | ...    |
| <b>4.—Whale Solubles.</b>      |          |                                |                                       |                                                                        |                      |            |              |                  |                                              |                               |        |
| "Whalpro" 42% Solubles Protein | 26       | THOMAS                         | W. Thomas & Co. (W.A.), Ltd.          | Condensed stick-water resulting from the extraction of oil from whales | 42.0                 | 2.0        | ...          | { 2.5<br>0.5*    | { 0.5<br>0.1*                                | { 0.05<br>0.01*               | ...    |



# STOCK FOODS—continued.

| Stock Food.               | Reg. No. | Brand.          | By whom Registered.                | Materials from which Made.                                                                                                                                                | Registered Analysis. |            |              |                  |                                              |                |             | Other. |
|---------------------------|----------|-----------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------|--------------|------------------|----------------------------------------------|----------------|-------------|--------|
|                           |          |                 |                                    |                                                                                                                                                                           | Crude Protein.       | Crude Fat. | Crude Fibre. | Sodium Chloride. | Phos. Acid (P <sub>2</sub> O <sub>5</sub> ). | Cal-cium (Ca). | % Sulphur   |        |
| 3.— <i>Calf Foods.</i>    |          |                 |                                    |                                                                                                                                                                           |                      |            |              |                  |                                              |                |             |        |
| Calf Food                 | 16       | EVE-LYN         | Tropical Traders & Patersons, Ltd. | Wheat, pollard, linseed (whole), salt, sugar, chalk, turmeric, sodium-bicarbonate, cream of tartar, foenugreek, ginger, coriander, copper sulphate (trace), bole armenian | 8.5                  | 2.0*       | 3.86         | { 3.5<br>2.5*    | 1.25<br>0.25*                                | 1.0<br>0.2*    | 1.75        | ...    |
| 20% Protein Calf Milk     | 31       | THOMAS          | W. Thomas & Co. (W.A.), Ltd.       | Buttermilk powder, dried blood, coconut meal, pollard, bone flour, oyster flour, salt, manganese sulphate, potassium iodide, iron sulphate, riboflavin                    | 20.0                 | 1.5*       | 6.0          | { 1.5<br>0.5*    | 0.8<br>0.2*                                  | 2.5<br>0.5*    | ...         | ...    |
| 20% Protein Calf Food     | 32       | do.             | do.                                | Linseed meal, coconut meal, milk powder, pollard, bone flour, oyster flour, salt, manganese sulphate, potassium iodide, iron sulphate, riboflavin                         | 20.0                 | 2.5*       | 8.0          | { 1.5<br>0.5*    | 0.8<br>0.2*                                  | 2.5<br>0.5*    | ...         | ...    |
| Calf Food                 | 57       | WESTERN         | David Gray & Co., Ltd.             | Malt grains, peanut meal, milk powder, yeast, pollard                                                                                                                     | 18.0                 | 6.0*       | 7.5          | { 1.5<br>0.5*    | 1.5<br>0.5*                                  | 1.0<br>0.15    | ...         | ...    |
| Do.                       | 66       | HARPER'S "STAR" | Robt. Harper & Co., Ltd.           | Wheat, oats, rice, barley, linseed, mustard, branning, whitening, salt and condiments                                                                                     | 12.0                 | 2.5*       | 10.0         | { 2.0<br>1.0*    | 2.5<br>1.0*                                  | 1.0<br>0.25    | ...         | ...    |
| Do.                       | 67       | PARSONS         | Parsons Bros. & Co Pty., Ltd.      | Wheat, oat branning, linseed, ground limestone, common salt                                                                                                               | 12.0                 | 2.0*       | 6.0          | { 1.28<br>1.2*   | 1.2<br>1.0*                                  | 2.15<br>1.95   | ...         | ...    |
| Do.                       | 70       | VETAMAC         | A. H. McDonald & Co. ....          | Wheat, pollard, maize meal, linseed meal, milk sugar, mutton bird oil                                                                                                     | 15.35                | 7.5*       | 1.5          | ...              | ...                                          | { 1.6<br>1.45  | ...         | ...    |
| Calf Meal                 | 83       | WESFARMERS      | Westralian Farmers Co-op., Ltd.    | Wheat meal, maize meal, peanut meal, linseed meal, pollard, buttermilk, minerals                                                                                          | 13.0                 | 2.5*       | 6.0          | { 1.0<br>0.5*    | ...                                          | { 1.0<br>0.5*  | ...         | ...    |
| 4.— <i>Sheep Foods.</i>   |          |                 |                                    |                                                                                                                                                                           |                      |            |              |                  |                                              |                |             |        |
| Sheep Food                | 17       | EVE-LYN         | Tropical Traders & Patersons, Ltd. | Pollard, salt, limestone, chalk, animal charcoal, molasses, sulphur, sulphate of iron, copper sulphate                                                                    | 5.0                  | 1.0*       | 5.0          | { 13.5<br>12.5*  | 4.0<br>3.5*                                  | 9.6<br>8.6*    | Sulphur 3.6 | ...    |
| Maintenance Sheep Nuts    | 58       | WESTERN         | David Gray & Co., Ltd.             | Malt grains, barley, oats, linseed, yeast, meat meal                                                                                                                      | 17.5                 | 3.0*       | 7.5          | { 1.5<br>0.5*    | 1.5<br>1.0*                                  | 2.0<br>1.0*    | ...         | ...    |
| Ewe and Lamb Sheep Nuts   | 59       | do.             | do.                                | Malt grains, yeast, linseed, meat meal                                                                                                                                    | 20.0                 | 3.0*       | 7.5          | { 1.5<br>0.5*    | 1.5<br>1.0*                                  | 2.0<br>1.0*    | ...         | ...    |
| Sheep Maintenance Cubes   | 84       | WESFARMERS      | Westralian Farmers Co-Ltd.         | Wheat meal, oat meal, barley meal, linseed meal, coconut meal, bone meal, molasses, minerals                                                                              | 14.0                 | 2.0*       | 7.5          | { 5.0<br>4.0*    | ...                                          | { 2.0<br>1.0*  | ...         | ...    |
| Sheep Breeder Cubes       | 85       | do.             | do.                                | Wheat meal, oat meal, barley meal, linseed meal, coconut meal, bone meal, meat meal, molasses, minerals                                                                   | 18.0                 | 2.0*       | 7.5          | { 1.0<br>0.5*    | ...                                          | { 1.0<br>0.5*  | ...         | ...    |
| 5.— <i>Poultry Foods.</i> |          |                 |                                    |                                                                                                                                                                           |                      |            |              |                  |                                              |                |             |        |
| Laying Mash               | 10       | K.B.            | C. A. Kirkby & Sons....            | Wheat, meat and bone meal, bran, pollard, oyster flour                                                                                                                    | 13.0                 | 3.5*       | 7.0          | { 1.5<br>1.0*    | 2.0<br>1.2*                                  | 2.0<br>1.9*    | ...         | ...    |

|                               |            |     |                                |                                                                                                                                                                            |      |      |     |                |              |              |     |     |
|-------------------------------|------------|-----|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-----|----------------|--------------|--------------|-----|-----|
| 16% Protein Laying Mash No. 1 | THOMAS     | ... | W. Thomas & Co. (W.A.) Ltd.    | Bran, pollard, meat meal, wheat meal, wheat germ, whole meal, whole solubles, blood meal, limestone, salt, manganese sulphate, potassium iodide, iron sulphate, riboflavin | 18.0 | 2.5* | 6.0 | { 2.0<br>1.0*  | 2.0<br>0.8*  | 3.75<br>1.0* | ... | ... |
| 20% Protein Laying Mash       | do.        | ... | do.                            | do.                                                                                                                                                                        | 20.0 | 1.5* | 6.0 | { 2.0<br>1.0*  | 2.0<br>1.0*  | 3.75<br>1.0* | ... | ... |
| 15% Protein Fattening Mash    | do.        | ... | do.                            | do.                                                                                                                                                                        | 15.0 | 2.0* | 6.5 | { 1.5<br>1.0*  | 1.0<br>0.5*  | 3.75<br>1.0* | ... | ... |
| Laying Mash No. 1             | MILLERS    | ... | W. H. Milne & Co.              | Bran, pollard, wheat meal, meat meal, milk powder, limestone, salt, manganese sulphate, potassium iodide, iron sulphate, riboflavin, wheat germ, whole solubles            | 16.0 | 3.0* | 6.0 | { 1.5<br>0.75  | 3.0<br>1.0   | 3.5<br>1.0   | ... | ... |
| Fattening Mash                | do.        | ... | do.                            | do.                                                                                                                                                                        | 13.0 | 3.0* | 6.0 | { 1.5<br>0.75* | 3.0<br>1.0*  | 3.5<br>1.0*  | ... | ... |
| A1 Laying Mash                | WESTERN    | ... | David Gray & Co. Ltd.          | Mill offal, wheat meal, meat meal, bone meal, yeast                                                                                                                        | 14.0 | 3.0* | 5.0 | { 0.5<br>0.1*  | 0.5<br>0.1*  | 0.5<br>0.3*  | ... | ... |
| Growing Mash                  | MORLAY     | ... | Robert B. Young                | Wheat meal, bran, pollard, meat meal, bone meal, whole solubles, oyster shell flour, minerals and riboflavin                                                               | 14.0 | 3.0* | 5.5 | { 0.5<br>0.75* | ...          | 5.0<br>2.5   | ... | ... |
| Laying Mash                   | do.        | ... | do.                            | do.                                                                                                                                                                        | 16.0 | 3.0* | 5.5 | { 2.0<br>0.75* | ...          | 4.0<br>2.0*  | ... | ... |
| D. Mash (Fattening)           | do.        | ... | do.                            | do.                                                                                                                                                                        | 11.0 | 3.0* | 5.5 | { 1.5<br>0.5*  | ...          | 4.0<br>2.0*  | ... | ... |
| Growers Mash                  | WESFARMERS | ... | Westralian Farmers Co-op. Ltd. | Wheat meal, pollard, bran, oat meal, butter milk, meat meal, whole meal, salt, bone meal, oyster flour                                                                     | 13.0 | 3.0* | 7.5 | { 1.0<br>0.5*  | ...          | 1.0<br>0.5*  | ... | ... |
| Growers Pellets               | RED COMB   | ... | do.                            | do.                                                                                                                                                                        | 13.0 | 3.0* | 7.5 | { 1.0<br>0.5*  | ...          | 1.0<br>0.5*  | ... | ... |
| Laying Mash No. 1             | WESFARMERS | ... | do.                            | do.                                                                                                                                                                        | 14.0 | 3.0* | 7.0 | { 1.0<br>0.5   | ...          | 1.0<br>0.5*  | ... | ... |
| Laying Pellets No. 1          | RED COMB   | ... | do.                            | do.                                                                                                                                                                        | 14.0 | 3.0* | 7.0 | { 1.0<br>0.5   | ...          | 1.0<br>0.5*  | ... | ... |
| Protein Laying Mash           | WESFARMERS | ... | do.                            | do.                                                                                                                                                                        | 20.0 | 3.0* | 7.0 | { 0.5*         | ...          | 2.0<br>1.0*  | ... | ... |
| Protein Paying Pellets        | RED COMB   | ... | do.                            | do.                                                                                                                                                                        | 20.0 | 3.0* | 7.0 | { 0.5*         | ...          | 2.0<br>1.0*  | ... | ... |
| All-Mash                      | WESFARMERS | ... | do.                            | do.                                                                                                                                                                        | 16.0 | 4.0* | 6.0 | { 0.5<br>0.25* | 0.5<br>0.25* | 2.0<br>1.0*  | ... | ... |
| All-Mash Pellets              | RED COMB   | ... | do.                            | do.                                                                                                                                                                        | 16.0 | 4.0* | 6.0 | { 0.5<br>0.25* | 0.5<br>0.25* | 2.0<br>1.0*  | ... | ... |
| Poultry Fattening Mash        | WESFARMERS | ... | do.                            | do.                                                                                                                                                                        | 13.0 | 1.5* | 6.0 | ...            | ...          | 0.5<br>0.5*  | ... | ... |
| Poultry Fattening Pellets     | RED COMB   | ... | do.                            | do.                                                                                                                                                                        | 13.0 | 1.5* | 6.0 | ...            | ...          | 0.5<br>0.5*  | ... | ... |
| Growing Mash                  | GROWELL    | ... | Barrow Linton & Co.            | Bran, pollard, wheat meal, meat meal, bone meal, shell grit, salt, riboflavin, emulsified fish oil                                                                         | 15.0 | 3.5* | 5.0 | { 1.0<br>0.75* | 3.0<br>2.5*  | 4.0<br>3.5*  | ... | ... |

\* Minimum.

STOCK FOODS—continued.

| Stock Food.               | Reg. No. | Brand.     | By whom Registered.                 | Materials from which Made.                                                                                                                                                                   | Registered Analysis. |            |              |                  |                                                   |                |        |
|---------------------------|----------|------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------|--------------|------------------|---------------------------------------------------|----------------|--------|
|                           |          |            |                                     |                                                                                                                                                                                              | Crude Protein.       | Crude Fat. | Crude Fibre. | Sodium Chloride. | Phosphoric Acid (P <sub>2</sub> O <sub>5</sub> ). | Calcium (Ca.). | Other. |
|                           |          |            |                                     |                                                                                                                                                                                              | % (Min.)             | % (Max.)   | % (Max.)     | % (Max.)         | % (Max.)                                          | % (Max.)       | %      |
| Laying Mash               | 104      | EGGLAYER   | do. do.                             | Bran, pollard, wheat meal, meat meal, bone meal, shell grit, salt                                                                                                                            | 17.0                 | 3.5*       | 5.0          | { 1.0<br>0.75*   | 3.0                                               | 4.0            | ...    |
| Fattening Mash            | 105      | DUKKO      | do. do.                             | Bran, pollard, wheat meal, meat meal, bone meal, shell grit, salt, riboflavin, emulsified fish oil                                                                                           | 15.0                 | 3.5*       | 5.0          | { 1.0<br>0.75*   | 3.0                                               | 3.5*           | ...    |
| Growing Mash              | 108      | MAYCO      | The Maylands Milling Co. Pty., Ltd. | Bran, pollard, wheat meal, meat meal, bone meal, shell grit, salt, riboflavin, emulsified fish oil                                                                                           | 15.0                 | 3.5*       | 5.0          | { 1.0<br>0.75*   | 3.0                                               | 3.5            | ...    |
| Special Laying Mash       | 109      | do.        | do. do.                             | Bran, pollard, wheat meal, meat meal, bone meal, shell grit, salt                                                                                                                            | 17.0                 | 3.5*       | 5.0          | { 1.0<br>0.75*   | 3.0                                               | 3.5            | ...    |
| Laying Mash               | 134      | PARSONS    | Parsons Bros. & Co. Pty., Ltd.      | Mill offal, wheat meal, meat meal, bone meal, yeast                                                                                                                                          | 14.0                 | 3.0*       | 5.0          | { 0.5<br>0.1*    | 0.5                                               | 0.5            | ...    |
| 6.—Chick Foods.           | 36       | THOMAS     | W. Thomas & Co. (W.A.), Ltd.        | Wheat, malze, peas, shellgrit                                                                                                                                                                | 9.0                  | 1.5*       | 4.5          | ...              | ...                                               | ...            | ...    |
| Chicken Grain             | 37       | do.        | do. do.                             | Bran, pollard, wheat meal, meat meal, blood meal, oyster flour, bone flour, wheat germ, salt, manganese sulphate, riboflavin, procaine penicillin Master G, potassium iodide, whale solubles | 18.0                 | 2.5*       | 6.0          | { 1.5<br>0.5*    | 3.0                                               | 2.5            | ...    |
| 18% Protein Chick Starter |          |            |                                     |                                                                                                                                                                                              |                      |            |              |                  | 1.0*                                              | 1.0*           | ...    |
| 15% Protein Chick Grower  | 38       | do.        | do. do.                             | Bran, pollard, wheat meal, meat meal, blood meal, butter milk powder, whale solubles, limestone, salt, manganese sulphate, potassium iodide, iron sulphate, riboflavin, wheat germ           | 15.0                 | 2.5*       | 6.0          | { 1.25<br>0.5*   | 1.0                                               | 1.5            | ...    |
| Chick Starter             | 50       | MILLERS    | W. H. Milne & Co.                   | Bran, pollard, wheat meal, meat meal, whey powder, bone meal, grit, oats, salt, veterinary emulsion, ribon                                                                                   | 16.0                 | 3.0*       | 6.0          | { 1.5<br>0.75*   | 3.0                                               | 3.5            | ...    |
| Chick Builder             | 51       | do.        | do. do.                             | Bran, pollard, wheat meal, bone meal, gristed oats, limestone, salt, veterinary emulsion                                                                                                     | 15.0                 | 3.0*       | 6.0          | { 1.5<br>0.75*   | 3.0                                               | 3.5            | ...    |
| Chick Food                | 52       | H. & C.    | Haynes & Clements                   | Wheat, maize, peas, grit                                                                                                                                                                     | 9.0                  | 1.5*       | 4.5          | ...              | ...                                               | ...            | ...    |
| Chick Starter             | 61       | WESTERN    | David Gray & Co., Ltd.              | Meat meal, milk powder, vitamin "A", oil, yeast, maize, liver meal                                                                                                                           | 16.0                 | 3.0*       | 5.0          | { 0.5<br>0.1*    | 0.5                                               | 0.5            | ...    |
| Chick Builder             | 62       | do.        | do. do.                             | Mill offal, wheat meal, meat meal, yeast, milk powder, maize                                                                                                                                 | 15.0                 | 3.0*       | 5.0          | { 0.5<br>0.1*    | 0.5                                               | 0.5            | ...    |
| Chick Food                | 68       | PARSONS    | Parsons Bros. & Co. Pty., Ltd.      | Wheat, maize, peas, grit                                                                                                                                                                     | 9.0                  | 1.5*       | 4.5          | ...              | ...                                               | ...            | ...    |
| Chicken Food              | 69       | ROYAL SEAL | J. & W. Bateman, Ltd.               | Wheat, maize, peas, grit                                                                                                                                                                     | 10.0                 | 2.0*       | 4.0          | 0.5              | 1.0                                               | 6.0            | ...    |
| Chick Starter             | 73       | MORLAY     | Robert B. Young                     | Wheat meal, bran, meat meal, milk powder, bone meal, oyster grit, whale solubles, vitamins, riboflavin, minerals                                                                             | 18.0                 | 3.0*       | 5.5          | { 1.75<br>0.75*  | 0.25                                              | 3.0            | ...    |
| Chick Allmash             | 74       | do.        | do. do.                             | Wheat meal, bran, meat meal, milk powder, bone meal, oyster grit, whale solubles, vitamins, riboflavin, minerals                                                                             | 15.0                 | 3.0*       | 6.0          | { 1.75<br>0.75*  | ...                                               | 2.0*           | ...    |



# STOCK FOODS—continued.

| Stock Food.                       | Reg. No. | Brand.        | By whom Registered.                   | Materials from which Made.                                                                                                                | Registered Analysis. |                  |                                              |                  |                                              |                  |                  |
|-----------------------------------|----------|---------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|----------------------------------------------|------------------|----------------------------------------------|------------------|------------------|
|                                   |          |               |                                       |                                                                                                                                           | Crude Protein.       | Crude Fat.       | Crude Fibre.                                 | Sodium Chloride. | Phos. Acid (P <sub>2</sub> O <sub>5</sub> ). | Cal-cium (Ca).   | Other.           |
| 10.— <i>Miscellaneous.</i>        |          |               |                                       |                                                                                                                                           | % (Min.)             | % (Max.)         | % (Max.)                                     | % (Max.)         | % (Max.)                                     | % (Max.)         | %                |
| Lin Meal ...                      | 63       | WESTERN ...   | David Gray & Co., Ltd.                | Malt, grains, linseed, peanut meal, yeast, bone meal                                                                                      | 18.0                 | 5.0*             | 5.0                                          | 1.5              | 1.5                                          | 1.0              | ...              |
| Proto-Lick ...                    | 123      | PROTO-LICK    | Goldsbrough Mort & Co., Ltd.          | Sugar cane, molasses, dried Blood meal                                                                                                    | 17.0                 | 0.1              | 1.0                                          | 0.5              | 0.5*                                         | 1.0              | ...              |
| C.— <i>Stock Licks.</i>           |          |               |                                       |                                                                                                                                           |                      |                  |                                              |                  |                                              |                  |                  |
| 1.— <i>Bone Meal.</i>             |          |               |                                       |                                                                                                                                           |                      |                  |                                              |                  |                                              |                  |                  |
| Sterilised Bone Flour             | 1        | TRICAL-OS ... | Davis Gelatine (Aust.) Pty. Ltd.      | Bones ...                                                                                                                                 | 5.0                  | ...              | ...                                          | ...              | 30.0*                                        | (Lime CaO) 40.0* | ...              |
| Bone Meal ...                     | 13       | ANCHO ...     | Anchorage Butchers Pty., Ltd.         | Waste meat products ...                                                                                                                   | 23.63                | 2.44*            | ...                                          | ...              | 26.76*                                       | 26.95*           | ...              |
| Bone Meal ...                     | 41       | THOMAS ...    | W. Thomas & Co. (W.A.), Ltd.          | Sterilised bones ...                                                                                                                      | 15.0                 | ...              | ...                                          | 1.0              | 15.0*                                        | 10.0*            | ...              |
| N.A. Sterilised Bone Grit Meal    | 42       | NEWCASTLE     | do. do.                               | Bones from animals slaughtered for human consumption                                                                                      | 20.0                 | 8.0*             | 1.0                                          | 0.2              | 20.0*                                        | 10.0*            | ...              |
| Bone Meal ...                     | 45       | W.A.M.E. ...  | The West Australian Meat Export Works | Bones ...                                                                                                                                 | 18.75                | ...              | ...                                          | 0.25             | 26.0*                                        | 27.0*            | ...              |
|                                   |          |               |                                       |                                                                                                                                           | Registered Analysis. |                  |                                              |                  |                                              |                  |                  |
| Stock Food.                       | Reg. No. | Brand.        | By whom Registered.                   | Materials from which Made.                                                                                                                | Crude Protein.       | Sodium Chloride. | Phos. Acid (P <sub>2</sub> O <sub>5</sub> ). | Lime (CaO).      | Iron (Fe).                                   | Copper (Cu).     | Other.           |
|                                   |          |               |                                       |                                                                                                                                           | % (Min.)             | % (Max.)         | % (Min.)                                     | % (Min.)         | %                                            | %                | %                |
| C.— <i>Stock Licks—continued.</i> |          |               |                                       |                                                                                                                                           |                      |                  |                                              |                  |                                              |                  |                  |
| 2.— <i>Mixed Stock Licks.</i>     |          |               |                                       |                                                                                                                                           |                      |                  |                                              |                  |                                              |                  |                  |
| Medicated Salt Block              | 11       | BLUE PETER    | Agricultural Products Co.             | Common salt and other mineral ingredients supplying iron, magnesium, copper, manganese, cobalt, zinc, iodine, potash                      | ...                  | 70.0             | 1.3                                          | 6.0              | 1.5                                          | ...              | Mag-nesium 7.5   |
| Denmark Lick Substitute           | 21       | C.S.M.L. ...  | Cuning Smith & Mt. Lyall F.F., Ltd.   | Limouite, sulphate of copper, salt                                                                                                        | ...                  | 38.0             | ...                                          | ...              | 20.0                                         | 0.14             | ...              |
| Copper Lick ...                   | 22       | do. ...       | do. do.                               | Di-calcic phosphate, copper sulphate, salt                                                                                                | ...                  | 66.0             | 12.5                                         | ...              | ...                                          | 0.10             | ...              |
| Di-Calcic Lick ...                | 23       | do. ...       | do. do.                               | Di-calcic phosphate, salt, molasses                                                                                                       | 38.0                 | 18.0             | 13.0                                         | ...              | ...                                          | ...              | ...              |
| Di-Calcic Phosphate               | 24       | do. ...       | do. do.                               | Calcium phosphate, at least 90% of the P <sub>2</sub> O <sub>5</sub> being as di-calcic phosphate                                         | ...                  | ...              | 37.0                                         | 28.0             | ...                                          | ...              | ...              |
| Cattle Lick ...                   | 64       | DAVID GRAY'S  | David Gray & Co., Ltd.                | Bone meal, common salt, yeast, minerals in the form of FeSO <sub>4</sub> , CuSO <sub>4</sub> , CoCl <sub>2</sub> , MnSO <sub>4</sub> , KI | ...                  | 80.0             | 1.0                                          | 5.0              | FeO 1.5                                      | ...              | ...              |
| Sheep Lick ...                    | 65       | do. do.       | do. do.                               | do. do. do.                                                                                                                               | Mag-nesia            | 80.0             | 1.0                                          | 5.0              | FeO 1.5                                      | ...              | Potassium Iodide |

|                                                               |     |               |                                     |       |      |       |       |                   |      |                             |                |
|---------------------------------------------------------------|-----|---------------|-------------------------------------|-------|------|-------|-------|-------------------|------|-----------------------------|----------------|
| Medicated Lick ...                                            | 77  | VETAMAC ...   | A. H. McDonald & Co. ...            | Trace | 53.0 | 5.7   | 7.5   | 0.7               | ...  | 4.0                         | 0.5            |
| Mineral Concentrate                                           | 78  | VETSOLICK ... | do. do. do.                         | 0.7   | ...  | 11.0  | 14.0  | 1.5               | ...  | 16.6                        | 0.5            |
| Stock Lick ...                                                | 102 | WESFARMERS    | Westralian Farmers Co-<br>op., Ltd. | ...   | 80.0 | 0.85  | 8.4   | 0.17              | 0.12 | Manganese<br>0.01           | Cobalt<br>0.02 |
| Mineralized Supplement for Stock                              | 113 | RAWLEIGH'S    | The W. T. Rawleigh Co.,<br>Ltd.     | ...   | 15.0 | 12.24 | 22.99 | 1.03              | ...  | Sulphur<br>3.5              | ...            |
| Poultry Powder<br>(Iodized)                                   | 114 | do. ...       | do. do. do.                         | ...   | ...  | 16.68 | 18.0  | 0.39              | ...  | Sulphur<br>4.0              | ...            |
| Cobaltised and Cop-<br>perised Concentrated Sheep Lick<br>"D" | 124 | VITA-LICK ... | Goldsbrough, Mort & Co.,<br>Ltd.    | ...   | ...  | 23.5  | 30.0  | {<br>2.5<br>1.3*  | ...  | Sulphur<br>{<br>3.0<br>2.0* | ...            |
| Cobaltised and Cop-<br>perised Sheep Lick Mixed "D"           | 125 | do. ...       | do. do. do.                         | ...   | 80.0 | 3.7   | 4.7   | 0.18*             | ...  | Sulphur<br>0.32*            | ...            |
| Cobaltised and Cop-<br>perised Concentrated Sheep Lick "G"    | 126 | do. ...       | do. do. do.                         | ...   | ...  | 23.5  | 31.0  | {<br>4.5<br>3.52* | ...  | Sulphur<br>{<br>5.0<br>4.0* | ...            |
| Cobaltised and Cop-<br>perised Sheep Lick Mixed "G"           | 127 | do. ...       | do. do. do.                         | ...   | 80.0 | 3.8   | 4.9   | 0.56*             | ...  | Sulphur<br>0.64*            | ...            |
| Cobaltised and Cop-<br>perised Cattle Lick Concentrated "D"   | 128 | do. ...       | do. do. do.                         | ...   | ...  | 21.2  | 29.0  | {<br>4.5<br>3.4*  | ...  | Sulphur<br>{<br>1.0<br>0.4* | ...            |

\* Minimum.

# STOCK FOODS—continued.

| Stock Food.                                             | Reg. | Brand.      | By whom Registered. | Materials from which Made.                                                                                                                                                                                  | Registered Analysis. |                  |                                              |             |               |                           |        |
|---------------------------------------------------------|------|-------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|----------------------------------------------|-------------|---------------|---------------------------|--------|
|                                                         |      |             |                     |                                                                                                                                                                                                             | Crude Protein.       | Sodium Chloride. | Phos. Acid (P <sub>2</sub> O <sub>5</sub> ). | Lime (CaO). | Iron (Fe).    | Copper (Cu).              | Other. |
| Cobaltised and Cop-<br>perised Cattle<br>Lick Mixed "D" | 129  | do.         | do. do.             | Bone flour (degelatinised), bone charcoal, sodium sulphate (anhydrous), flowers of sulphur, potassium iodide, copper sulphate, cobalt chloride, and meals derived from rice, cocoa, and wheat               | %<br>(Min.)          | %<br>(Max.)      | %<br>(Min.)                                  | %<br>(Min.) | %             | %                         | %      |
|                                                         |      |             |                     |                                                                                                                                                                                                             | ...                  | 75.0             | 4.2                                          | 5.4         | 0.64*         | Sulphur<br>0.08*          | ...    |
| Cobaltised and Cop-<br>perised Cattle<br>Lick, "G"      | 130  | do.         | do. do.             | Bone flour (degelatinised), bone charcoal, limonite, flowers of sulphur, potassium iodide, copper sulphate, cobalt chloride, and meals derived from rice, cocoa, and wheat                                  | ...                  | ...              | 24.5                                         | 31.0        | { 5.5<br>4.7* | { Sulphur<br>2.0<br>1.15* | ...    |
|                                                         |      |             |                     |                                                                                                                                                                                                             | ...                  | 75.0             | 4.4                                          | 5.8         | 0.88*         | Sulphur<br>0.22*          | ...    |
| Cobaltised and Cop-<br>perised Cattle<br>Lick Mixed "G" | 131  | do.         | do. do.             | Bone flour (degelatinised), bone charcoal, sodium sulphate (anhydrous), flowers of sulphur, potassium iodide, copper sulphate, cobalt chloride, and meals derived from rice, cocoa, and wheat               | ...                  | ...              | ...                                          | ...         | ...           | ...                       | ...    |
|                                                         |      |             |                     |                                                                                                                                                                                                             | ...                  | ...              | ...                                          | ...         | ...           | ...                       | ...    |
| Por-co-vite                                             | 132  | POR-CO-VITE | do. do.             | Bone flour (degelatinised), bone charcoal, sodium sulphate (anhydrous), flowers of sulphur, sodium chloride, limonite, calcium carbonate, copper sulphate, cobalt chloride, potassium iodide, cod liver oil | ...                  | 14.0             | 19.1                                         | 30.0        | 0.62*         | Sulphur<br>9.7*           | ...    |

\* Minimum.

# SUNRISE AND SUNSET TIMES FOR JAN.-FEB., 1953

(Supplied by the Government Astronomer)

Times of sunrise and sunset for every fifth day, are given for a number of towns throughout the State. Times for a town not on the list may be estimated if its position in relation to one or more of the listed towns is known. The times given for sunrise are those of the first appearance of the top edge of the sun over a true horizon; those for sunset give the time of the sun's disappearance below a true horizon. Situation in a valley would make the sun appear to rise later, and on a hill it would appear earlier.

| SUNRISE   |               |         |               |         |            |         |            |        |             |                 |           |        |         |          |           |         |          |            |             |            |            |               |         |
|-----------|---------------|---------|---------------|---------|------------|---------|------------|--------|-------------|-----------------|-----------|--------|---------|----------|-----------|---------|----------|------------|-------------|------------|------------|---------------|---------|
| Month.    | Day of Month. | Broome. | Port Hedland. | Onslow. | Carnarvon. | Yalgoo. | Geraldton. | Moora. | Kalgoorlie. | Southern Cross. | Merredin. | Perth. | Tammin. | Northam. | Narrogin. | Collie. | Bunbury. | Katanning. | Bridgetown. | Hope town. | Esperance. | Cape Leeuwin. | Albany. |
| Jan. .... | 1             | 5.19    | 5.30          | 5.40    | 5.39       | 5.20    | 5.27       | 5.16   | 4.54        | 5.3             | 5.7       | 5.15   | 5.8     | 5.11     | 5.7       | 5.11    | 5.13     | 5.3        | 5.8         | 4.53       | 4.46       | 5.13          | 4.58    |
| "         | 5             | 5.22    | 5.33          | 5.43    | 5.41       | 5.22    | 5.29       | 5.19   | 4.57        | 5.6             | 5.10      | 5.17   | 5.10    | 5.13     | 5.10      | 5.14    | 5.16     | 5.5        | 5.10        | 4.55       | 4.48       | 5.15          | 5.1     |
| "         | 10            | 5.24    | 5.36          | 5.46    | 5.45       | 5.26    | 5.33       | 5.23   | 5.1         | 5.10            | 5.14      | 5.21   | 5.14    | 5.17     | 5.14      | 5.18    | 5.20     | 5.9        | 5.14        | 4.59       | 4.52       | 5.19          | 5.5     |
| "         | 15            | 5.27    | 5.39          | 5.49    | 5.48       | 5.30    | 5.37       | 5.27   | 5.5         | 5.14            | 5.18      | 5.26   | 5.19    | 5.22     | 5.18      | 5.22    | 5.24     | 5.14       | 5.19        | 5.4        | 4.57       | 5.24          | 5.10    |
| "         | 20            | 5.31    | 5.43          | 5.53    | 5.52       | 5.35    | 5.42       | 5.32   | 5.10        | 5.19            | 5.23      | 5.31   | 5.24    | 5.27     | 5.23      | 5.27    | 5.29     | 5.19       | 5.24        | 5.9        | 5.2        | 5.29          | 5.15    |
| "         | 25            | 5.34    | 5.46          | 5.56    | 5.56       | 5.39    | 5.46       | 5.36   | 5.14        | 5.23            | 5.27      | 5.35   | 5.28    | 5.31     | 5.28      | 5.32    | 5.34     | 5.24       | 5.29        | 5.14       | 5.7        | 5.34          | 5.20    |
| "         | 31            | 5.38    | 5.50          | 6.1     | 6.1        | 5.44    | 5.52       | 5.42   | 5.20        | 5.29            | 5.33      | 5.41   | 5.34    | 5.37     | 5.35      | 5.39    | 5.41     | 5.31       | 5.36        | 5.21       | 5.14       | 5.41          | 5.27    |
| Feb. .... | 1             | 5.38    | 5.50          | 6.1     | 6.2        | 5.45    | 5.52       | 5.43   | 5.21        | 5.30            | 5.34      | 5.42   | 5.35    | 5.38     | 5.36      | 5.40    | 5.42     | 5.32       | 5.37        | 5.22       | 5.15       | 5.42          | 5.28    |
| "         | 5             | 5.40    | 5.53          | 6.4     | 6.5        | 5.48    | 5.55       | 5.46   | 5.24        | 5.33            | 5.37      | 5.46   | 5.39    | 5.42     | 5.39      | 5.43    | 5.45     | 5.36       | 5.41        | 5.26       | 5.19       | 5.46          | 5.32    |
| "         | 10            | 5.42    | 5.55          | 6.6     | 6.7        | 5.52    | 5.59       | 5.50   | 5.28        | 5.37            | 5.41      | 5.50   | 5.43    | 5.46     | 5.43      | 5.47    | 5.49     | 5.40       | 5.45        | 5.30       | 5.23       | 5.50          | 5.36    |
| "         | 15            | 5.45    | 5.58          | 6.10    | 6.11       | 5.55    | 6.3        | 5.55   | 5.33        | 5.42            | 5.46      | 5.54   | 5.47    | 5.50     | 5.48      | 5.52    | 5.54     | 5.44       | 5.49        | 5.34       | 5.27       | 5.54          | 5.41    |
| "         | 20            | 5.47    | 6.0           | 6.12    | 6.15       | 6.0     | 6.8        | 6.0    | 5.38        | 5.47            | 5.51      | 6.0    | 5.53    | 5.56     | 5.53      | 5.57    | 5.59     | 5.50       | 5.55        | 5.40       | 5.33       | 6.0           | 5.47    |
| "         | 25            | 5.49    | 6.3           | 6.15    | 6.18       | 6.3     | 6.11       | 6.3    | 5.41        | 5.50            | 5.54      | 6.3    | 5.56    | 5.59     | 5.57      | 6.1     | 6.3      | 5.54       | 5.59        | 5.44       | 5.37       | 6.4           | 5.51    |
| "         | 28            | 5.49    | 6.3           | 6.16    | 6.19       | 6.4     | 6.13       | 6.5    | 5.43        | 5.52            | 5.56      | 6.5    | 5.58    | 6.1      | 6.0       | 6.4     | 6.6      | 5.57       | 6.2         | 5.47       | 5.40       | 6.7           | 5.54    |
|           |               |         |               |         |            |         |            |        |             |                 |           |        |         |          |           |         |          |            |             |            |            |               |         |
| SUNSET    |               |         |               |         |            |         |            |        |             |                 |           |        |         |          |           |         |          |            |             |            |            |               |         |
| Jan. .... | 1             | 6.29    | 6.49          | 7.7     | 7.19       | 7.14    | 7.25       | 7.24   | 7.2         | 7.11            | 7.15      | 7.27   | 7.20    | 7.23     | 7.25      | 7.29    | 7.31     | 7.25       | 7.30        | 7.15       | 7.8        | 7.35          | 7.26    |
| "         | 5             | 6.31    | 6.50          | 7.8     | 7.20       | 7.15    | 7.26       | 7.24   | 7.2         | 7.11            | 7.15      | 7.28   | 7.21    | 7.24     | 7.25      | 7.29    | 7.31     | 7.26       | 7.31        | 7.16       | 7.9        | 7.36          | 7.26    |
| "         | 10            | 6.32    | 6.51          | 7.9     | 7.20       | 7.15    | 7.26       | 7.24   | 7.2         | 7.11            | 7.15      | 7.28   | 7.21    | 7.24     | 7.25      | 7.29    | 7.31     | 7.26       | 7.31        | 7.16       | 7.9        | 7.36          | 7.26    |
| "         | 15            | 6.33    | 6.51          | 7.9     | 7.20       | 7.14    | 7.25       | 7.23   | 7.1         | 7.10            | 7.14      | 7.26   | 7.19    | 7.22     | 7.24      | 7.28    | 7.30     | 7.24       | 7.29        | 7.14       | 7.7        | 7.34          | 7.24    |
| "         | 20            | 6.34    | 6.52          | 7.10    | 7.20       | 7.13    | 7.24       | 7.22   | 7.0         | 7.9             | 7.13      | 7.25   | 7.18    | 7.21     | 7.23      | 7.27    | 7.29     | 7.23       | 7.28        | 7.13       | 7.6        | 7.33          | 7.23    |
| "         | 25            | 6.33    | 6.51          | 7.8     | 7.18       | 7.12    | 7.22       | 7.20   | 6.58        | 7.7             | 7.11      | 7.23   | 7.16    | 7.19     | 7.21      | 7.25    | 7.27     | 7.21       | 7.26        | 7.11       | 7.4        | 7.31          | 7.21    |
| "         | 31            | 6.32    | 6.50          | 7.7     | 7.16       | 7.9     | 7.19       | 7.17   | 6.55        | 7.4             | 7.8       | 7.20   | 7.13    | 7.16     | 7.17      | 7.21    | 7.23     | 7.17       | 7.22        | 7.7        | 7.0        | 7.27          | 7.17    |
| Feb. .... | 1             | 6.31    | 6.49          | 7.6     | 7.15       | 7.8     | 7.19       | 7.16   | 6.54        | 7.3             | 7.7       | 7.19   | 7.12    | 7.15     | 7.16      | 7.20    | 7.22     | 7.16       | 7.21        | 7.6        | 6.59       | 7.26          | 7.16    |
| "         | 5             | 6.30    | 6.48          | 7.5     | 7.14       | 7.6     | 7.17       | 7.14   | 6.52        | 7.1             | 7.5       | 7.17   | 7.10    | 7.13     | 7.13      | 7.17    | 7.19     | 7.13       | 7.18        | 7.3        | 6.56       | 7.23          | 7.13    |
| "         | 10            | 6.29    | 6.46          | 7.3     | 7.11       | 7.3     | 7.14       | 7.10   | 6.48        | 6.57            | 7.1       | 7.13   | 7.6     | 7.9      | 7.9       | 7.13    | 7.15     | 7.9        | 7.14        | 6.59       | 6.52       | 7.19          | 7.8     |
| "         | 15            | 6.26    | 6.43          | 6.59    | 7.8        | 7.0     | 7.10       | 7.6    | 6.44        | 6.53            | 6.57      | 7.8    | 7.1     | 7.4      | 7.5       | 7.9     | 7.11     | 7.4        | 7.9         | 6.54       | 6.47       | 7.14          | 7.3     |
| "         | 20            | 6.23    | 6.40          | 6.56    | 7.3        | 6.54    | 7.4        | 7.0    | 6.38        | 6.47            | 6.51      | 7.2    | 6.55    | 6.58     | 6.59      | 7.3     | 7.5      | 6.58       | 7.3         | 6.48       | 6.41       | 7.8           | 6.57    |
| "         | 25            | 6.20    | 6.36          | 6.52    | 6.59       | 6.49    | 6.59       | 6.55   | 6.33        | 6.42            | 6.46      | 6.57   | 6.50    | 6.53     | 6.53      | 6.57    | 6.59     | 6.52       | 6.57        | 6.42       | 6.35       | 7.2           | 6.51    |
| "         | 28            | 6.18    | 6.34          | 6.49    | 6.56       | 6.47    | 6.56       | 6.52   | 6.30        | 6.39            | 6.43      | 6.54   | 6.47    | 6.50     | 6.49      | 6.53    | 6.55     | 6.48       | 6.53        | 6.38       | 6.31       | 6.58          | 6.47    |

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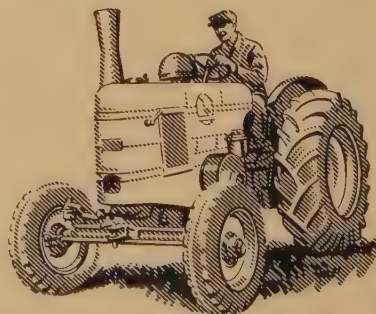
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